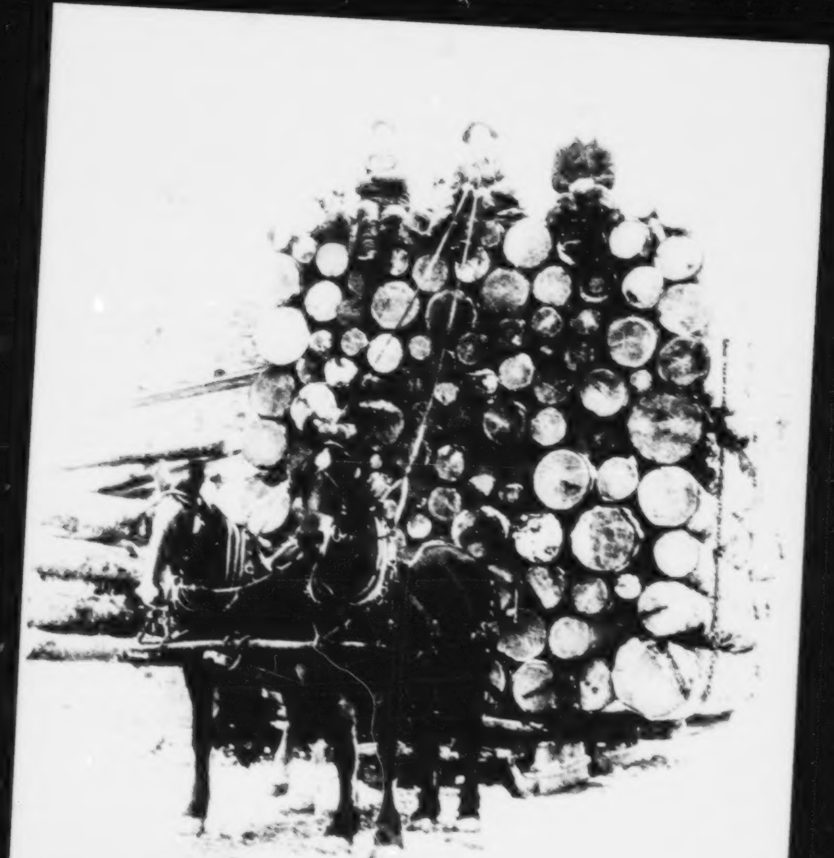
FORESTS
of
NOVA SCOTIA



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Cover photo: The brag load:
On some winter Sundays in logging camps in the 1920s and 1930s — as in this one believed to be in Cumberland County — workers would compete to build as large a load as possible. Once the load was built, the trick was to get it started. The men used to "yee-haw" the horses, getting them to go from side to side to loosen the runners. Then, the men would get behind the load with peaveys and push to get it going. Once it was started, it was no problem to keep going on the icy, level surface.

Provided by D. B. Lacy

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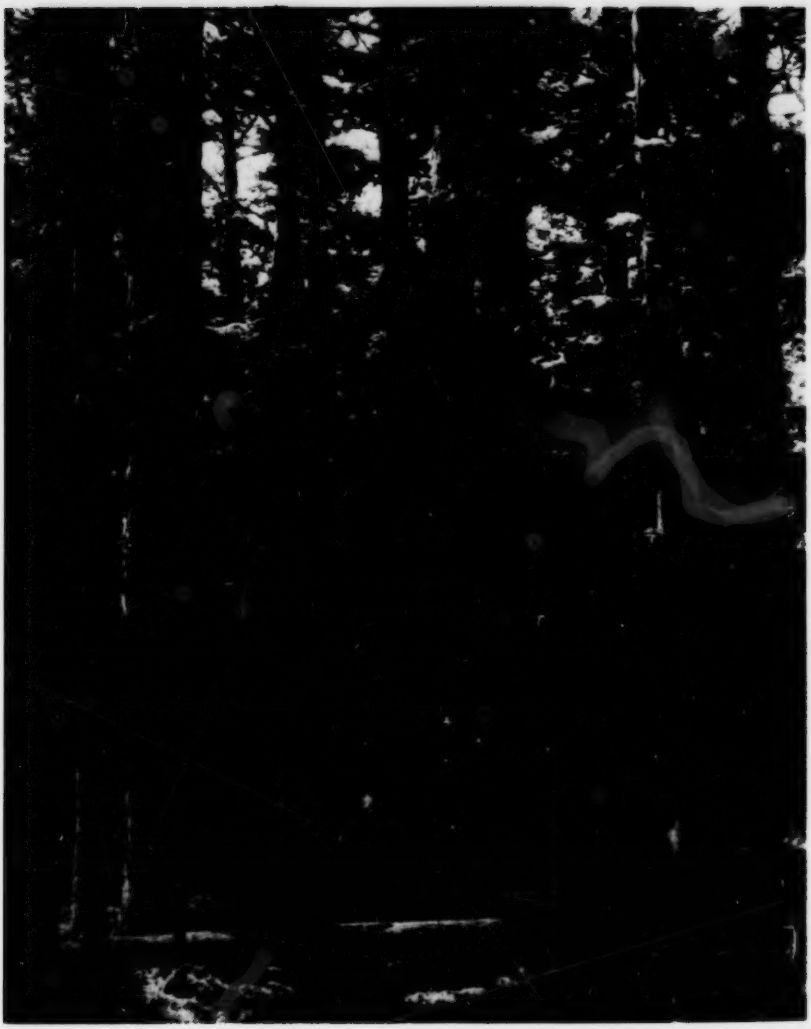

Old growth hemlock forest at Jordan Lake, Queens County. **Courtesy of N. S. Information Bureau**

FORESTS
of
NOVA SCOTIA

a history

RALPH S. JOHNSON

Nova Scotia
Department of
Lands and Forests

Four East
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Halifax, Nova Scotia 1986

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To Wilfrid Creighton

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Ralph S. Johnson
Liverpool, N.S., 1982

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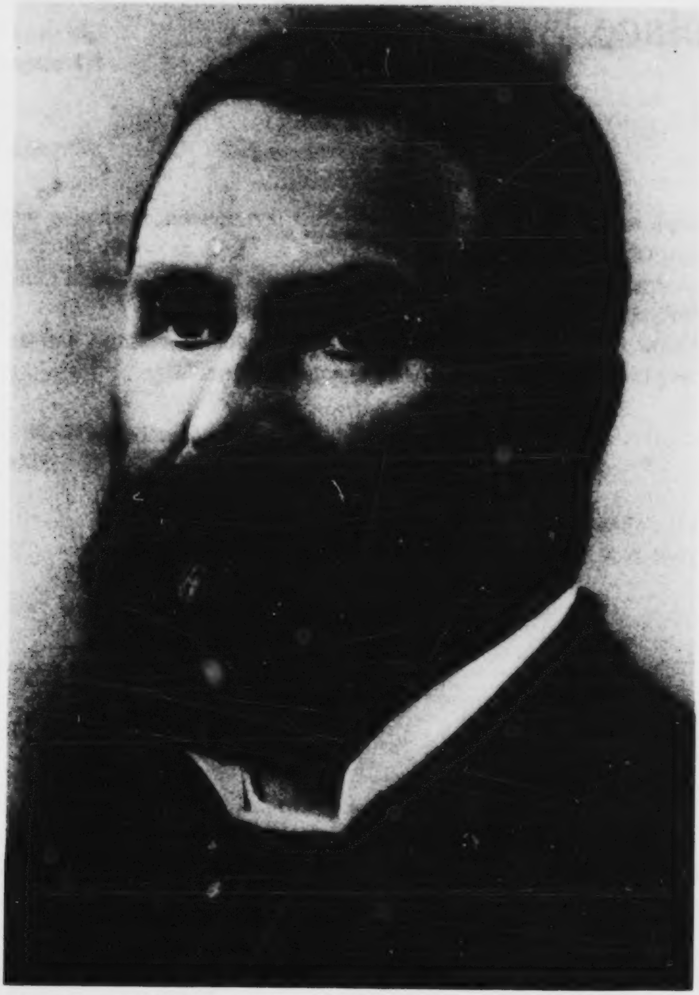
Preface

This book is a history of the forests and their components, beginning with the recession of the last ice age and continuing to 1982. It briefly describes the history of people in their relationship with forests, and of the forest industries, transportation, forest legislation, and forestry organizations.

Some forest industries are described in detail, because information regarding these particular industries was readily available.

Ralph S. Johnson
Liverpool, N.S., 1982



Thomas Gotobed McMullen, the "Lumber King of Nova Scotia", 1844-1925.

Courtesy of Mrs. Alison McMullen Yeadon.

Foreword

A forest is "an ecosystem characterized by a more or less dense and extensive tree cover—a plant community predominantly of trees and other woody vegetation, growing more or less closely together," according to the Society of American Foresters.[1]

Although the most evident feature of a forest is the trees, a forest could not exist without its less evident components. Lichens and mosses on rocks and ground each have their functions in preparing and supporting soils and forest growth. The forest ecosystem also includes billions of microorganisms and insects per acre, most of them working within or beneath the forest litter to create humus from the waste on the forest floor. Flying insects, many of which spend part of their lives beneath ground or water surfaces, are important parts of the forest ecosystem. So are birds and mammals. Man himself is an important part of this relationship; the only people known to have lived independently of forests are the Inuit.

Most of the forms of life within a forest are beneficial to it; some, however, are harmful and some are neutral. Those which are benevolent include the soil builders and improvers, the pollinators, the tree seed distributors and those that destroy harmful organisms. Harmful organisms include species of shrubs (e.g., huckleberry and sheep laurel) that under some conditions have permanently replaced forests in Nova Scotia, insects that defoliate or deform trees, bark beetles, wood borers, fungi that damage or kill trees, man and, occasionally, browsing animals. Pests such as mosquitoes and blackflies are considered neutral organisms.

Although the forest usually appears quiet and peaceful, within its boundaries the struggle for existence is terrific and continuous, below as well as above the ground surface. The struggle is waged between competing species, between predator and prey, and between like organisms. Thousands of seedlings, for example, often start growing where there is living space for only hundreds of mature trees. Although the strongest starters usually reach maturity, weak starters can become strong mature trees when adjacent strong trees are eliminated.

On the whole, man has been the worst enemy of Nova Scotia's forests. People have needlessly caused fires that have destroyed thousands of acres of timber; much of this acreage has been burnt repeatedly. Man has also introduced foreign forest insects and diseases into Nova Scotia. With few exceptions, these introduced forest enemies have been more harmful than indigenous ones.

Forests have often been harvested without regard to the future due to ignorance, poor logging techniques, and the demand for low-cost forest products. Today we are paying for the mistakes of past generations. Our children will pay more dearly than we for these past errors and for our current errors in managing natural resources.

1 PHYSICAL NOVA SCOTIA

Nova Scotia's topography is constantly changing in response to tide and storm. Eons ago, glaciers deposited some of the richest soils in the ocean and left glacial till in their wake. As the glaciers receded the almost continuous land mass connecting Massachusetts with Nova Scotia began to flood. Today, the sea still encroaches on beaches and agricultural land each year.

THE SETTING

Nova Scotia is a northeastern continuation of the Appalachian Mountain system which parallels the Atlantic Coast of North America from Alabama to northern Newfoundland. According to E. R. Faribault, who made geological surveys of parts of Nova Scotia in the early 1900s, some peaks in this province were once more than three miles higher than they are at present.[2]

Nova Scotia includes not only the mainland peninsula and Cape Breton Island, but also Sable Island, 110 miles southeast of Canso, Nova Scotia.

The present area of the province is approximately 22,308 square miles, comprised as follows:

Categories	**Square Miles**
Land (mainland and Cape Breton Island)	20,519
Fresh water	1,154
Flowage (includes some swamps)	137
	21,810
Offshore islands	67
	21,877
Bras d'Or Lakes	417
	22,294
Sable Island	14
TOTAL	22,308

MAINLAND NOVA SCOTIA

About two-thirds of the area of Nova Scotia drains southward directly into the Atlantic Ocean while the other third drains into the Bay of Fundy and Northumberland Basin. The rivers are small; the Mersey and the LaHave, the two largest, are each about 60 miles long.

The rock strata exposed in the province are largely metamorphic and sedimentary. Successive upheavals, foldings, crumplings, and volcanic activity with intrusions of granite and other igneous rock, have created a motley grouping of formations. The oldest of these formations, which evolved a half billion to one billion years ago, is confined to Cape Breton Island and includes most of the highlands there. The youngest, formed about 200 million years ago, occur mainly along the Fundy Coast and include North Mountain.

Today, the highest land in Nova Scotia is in Cape Breton Highlands, where the maximum elevation is over 1,700 feet at several points near the heads of the Margaree and Cheticamp rivers. Other comparatively high areas are the Cobequid Mountains in southern Cumberland County and northern Colchester County. Although not known by this name east of Colchester County, these high areas extend east and south into Pictou and Antigonish, Halifax and Guysborough counties. Only a few small areas reach elevations of more than 1,000 feet in the Cobequids. North Mountain is a narrow ridge running between the Annapolis Valley and the Bay of Fundy. South Mountain, south of Annapolis Valley, extends from Yarmouth County through Digby, Annapolis and Kings counties into northern Lunenburg and western Hants counties. Elsewhere, these so-called mountains range only from 500 to 1,000 feet in elevation although they do have numerous steep slopes and occasional cliffs.

Granite, the most common rock underlying Nova Scotia, comprises most of the high land although it also occurs extensively in some lower areas. Shale, quartzite, limestone and sandstone are also common; 13 other kinds of rock, including coal and gypsum, occur less frequently.

During the ice age, four continental glaciers successively covered Nova Scotia, wearing the high peaks down, leaving glacial debris behind, and depositing most of the better soils under the sea to form the fishing banks off the coast.

Strangely, there is little evidence of glaciation on the Cape Breton Highlands. These highlands were probably covered by heavy ice towards the end of the last glacial period but apparently not to a thickness great enough to cause the typical glacial erosion that occurred elsewhere.

About 40,000 years ago, so much of the world's water was frozen in glaciers that the sea level was as much as 400 feet lower than it now is and land areas were much more extensive. When the continental glaciers began slowly receding about 16,000 B.C., the seas rose. For centuries after the recession of the glacier along the Atlantic Coast of North America, however, almost continuous land connected Nova Scotia with present-day Massachusetts and southern Maine. This land, ice-free in summer, extended more than 100 miles seaward from the present Atlantic Coast of Nova Scotia. As the ice melted, the sea rose very slowly to ultimately reduce this land mass to somewhat near its current extent about 8000 B.C.

The receding glaciers left mineral soils even more varied than the underlying rock. Although most soils are characteristic of the underlying bedrock, some were carried as glacial drift for miles into other bedrock zones. The soils of Annapolis Valley are mostly derived from red Triassic sandstone and glacial till. Some of these soils are of coarse texture and, because of their sandy nature, are very droughty. Though poor for agriculture, they are good for red pine forests.

Hants, Colchester, Cumberland, Pictou, Antigonish and Cape Breton counties are comprised mainly of Carboniferous lowlands. The parent materials are glacial till with sandy and clay loams on the surface, varying greatly in stoniness and relief. In the southern uplands, the underlying rocks are granite, slate and quartzite. These soils are generally excessively stony, and frequent outcrops and large boulders occur in the granite and quartzite areas. Although peat bogs occupy many of the depressions and there are many swamps, the soils are generally well drained. The soils of the Cobequid Mountains, North Mountain and highlands of Pictou, Antigonish and Cape Breton are similar to those in the southern uplands—too shallow or stony for agriculture. However, because they developed from basic igneous rock, their fertility is somewhat higher.

Wet upland muskegs occur on the Cape Breton Highlands; the only one known to the writer in western Nova Scotia lies one mile west of the head of Port L'Hebert in Shelburne County. On the highlands, the soils are thin and drainage is relatively poor. The Cape Breton lowland soils are generally better developed with better drainage except along the south coast.

From the time the forests spread over Nova Scotia following the last glaciation, they deposited a great deal of litter on the ground. Most has since decomposed into humus, forming a thin layer of rich but acidic soil on top of the mineral soil. (The brownish water in most of Nova Scotia's lakes and streams in fact results from decomposed vegetable matter on the forest floor.)

The high rainfall, forest vegetation and cool climate have produced leaching of the soils—that is, removal of a large proportion of the basic elements such as calcium, magnesium, potassium and sodium from upper to lower layers.[3] Leaching has also moved iron and aluminum down to a zone of accumulation, a process called podzolization. Soils thus formed are called podzols. They are naturally infertile and require liming and fertilization for good farm crop production. Sufficient nutrients are released by weathering of primary minerals, however, to supply growth requirements of slow-growing crops such as trees.

Some Nova Scotian soils have an "ortstein" or hardpan layer within a few inches to a foot or so below the surface. This hardpan was caused by soil compaction, probably from the tremendous weight of glacial ice. It resists water and root penetration; in some cases it is impervious to water and restricts rooting to within a few inches of the surface. In many areas, though, this hardpan is weak and discontinuous, permitting better rooting and growth. Where the hardpan is impenetrable and close to the ground surface, the land is mostly barren, particularly where fire has spread over the surface.

Physical Nova Scotia is still constantly changing, its coastline eroded by storms and tides. Extensive areas of beaches are being washed away, and some bays and harbours are being filled by sand, destroying eel grass and clam flats. The most noticeable erosion has occurred along the Fundy shores, mainly in Minas Basin and Chignecto Bay where the tides are at their strongest. For years, good agricultural land has been washed away there at an alarming rate. In addition, erosion along the Atlantic Coast and Gulf of St. Lawrence is cutting back headlands and reducing coastal islands to clusters of rocks—islands that supported tree growth as recently as the late twenties.

SABLE ISLAND

Sable Island is an island of shifting sand presently slightly more than 20 miles long and less than three-quarters of a mile wide, located within 50 miles of the edge of the Scotian Shelf and some 174 miles east of Halifax. It is the exposed top of the eastern part of Sable Island Bank which is about 150 miles long and 70 miles wide.

This crescent-shaped island, lying nearly east and west atop its larger underwater bank, was part of the extended land surface of Nova Scotia 3,000 to 14,000 years ago. As the oceans rose with the melting of the glaciers, the sand of Sable Island Bank was—and still is—subjected to a clockwise circulation of tides and currents. This built the dunes of Sable Island several thousand years ago. The island comprises two long dunes with a valley between. In this valley is a lake which in 1900 was about nine miles long and more than a half mile wide but which is now less than two miles long and a quarter mile wide. The northern dune is the higher and reaches a maximum elevation of 100 feet.

Although some historians have said that Sable Island has shifted 20 miles eastward in the past 200 years, it appears that the western end of the island is now only about two miles east of its location 200 years ago and that the eastern end is about two miles west of its former location. The possibility of the island being obliterated by a severe storm appears to be greater than that it will be washed into the abyss beyond the Scotian Shelf, as some have claimed.

There would perhaps be no Sable Island now were it not for the tenacious sand-holding power of marram or beach grass. This stiff-stalked grass, two varieties of beach pea bushes, yarrow, goldenrod, cranberries, creeping juniper and a low-lying variety of common juniper, along with a few other species of sand and bog or wet-soil plants, comprise the sparse vegetation.

Attempts were made in 1901 by the Canadian government to afforest Sable to control the shifting sands. More than 80,000 trees and shrubs were planted and 30 pounds of pine seed were scattered over some upland parts of the island. As part of this effort, or perhaps a year or two later, a Mr. Gordeau, Minister of Marine and Fisheries, had 2,000 willow transplants set out on Sable Island. This was a species which grew on sandy soil in France. The first planting was made with no fencing and the famous Sable Island ponies soon consumed the entire plantation. A second attempt with this willow was made the next year, planting about a half acre which was fenced. But these transplants did not survive either, because the wind-driven sand blasted the bark off the young trees. By the 1920s nothing was left of these efforts except some of the fence posts. For some years, this was known among Coast Guard personnel as "Gordeau's Park."

Since the start of oil exploration on the island, and long before that, man's destructive forces have upset the ecology. Most of the damage consists of disturbance of the vegetation, leaving loose sand exposed to the wind. Small holes in the sand are soon blown out to become big holes and gullies.

Following urging from the Nova Scotia Resource Council and other concerned parties, in 1973 the federal Ministry of Transport formed the Sable Island Environmental Advisory Committee to prepare an environmental guide for operations on the island. Insufficient funding curtailed implementation of these recommendations, but one good outcome was the erection of snow fences at strategic points, causing the wind to drop sand leeward of the fences. Marram grass soon holds this sand in place.

Despite its past destructiveness in shipwrecks, Sable Island has considerable value to Canada beyond its possible oil and gas reserves. Conservation of the island and its unusual ecology should be a priority.

2 LIFE COMES TO THE REGION

Plant life followed each of the ice ages. And with it, following the last glacier, came the caribou and people. Gradually man's ability to design and use tools improved. As always, he depended on the forests for food, fuel and clothing, and for materials for many of his tools.

PLANT LIFE

Over the eons, glaciers advanced southward and retreated northward across Nova Scotia at least four times. Plant and animal life followed each of these ice changes. A thigh bone and tooth of a mastodon (*giganteus*), found at Middle River, Victoria County, is in the Nova Scotia Museum at Halifax. This is said to have been radiocarbon dated at about 30,000 B.C., but according to Bjom Kurten in the National Geographic book *Our Continent*, all of eastern Canada was frozen in the grip of a glacier from 70,000 to 12,000 years ago.[4] However, one geologist (M. L. Fernald) suggested that, based on his botanical and geological findings, the Cape Breton Highlands may have escaped glaciation.[5] As the last glacier melted, retreating at an irregular rate of less than a hundred yards per year, tundra followed. At times, tundra must have stretched almost up to the edge of the thick ice. By 9000 B.C., taiga (sparse, coniferous growth) had spread into this region from the south across almost continuous land that is now covered by water between Massachusetts and Nova Scotia.

Black spruce was probably the pioneer tree species, followed by tamarack, white spruce, balsam fir, and the aspens. Before the seas covered that land, circa 8000 B.C., most of the native species of trees now in Nova Scotia were here although not in their present distributions. After the glaciers melted, any further invasion of this area was over land formed nearly as it now is or by water.

One indication of the invasion of Nova Scotia by plant life over land from Massachusetts is the dozens of plant species that now occur in western Nova Scotia and Massachusetts but not in the intervening areas of Maine and New Brunswick. These include highbush blueberry, poison ivy, green or cat briar, inkberry, small knotweed and some grass species. In addition, Dr. Paul Keddy of the University of Ottawa cited a number of aquatic plants in the 1985 summer edition of the *Bowater Mersey Quarterly*. Most of these plant species found here now range elsewhere only from Massachusetts southward; a few also occur on Sable Island.

Pollen analyses of bogs in western Nova Scotia and Cape Breton, although not entirely dependable, give some indication of prehistoric tree species and forest succession. Pollens were not radiocarbon dated, so dating of succession must be based on the assumption that vertical pollen distribution was nearly chronologically uniform. The ages of the oldest pollens are merely educated guesses. The earliest pollen found in bogs near Tusket, Caribou and Heath in western Nova Scotia indicate that, circa 6000 B.C., spruce comprised about 30 to 50 per cent of the forest in those localities, pine 40 per cent, fir 5 to 20 per cent, birch up to 20 per cent; hemlock, oak, basswood, elm and ironwood were also found to a lesser degree. Chronologically, these percentages varied for the various genera. Spruce had dropped as low as 5 per cent by 4000 B.C. and rebounded to 10 to 20 per cent by 1000 B.C. Pine increased to 50 per cent about 5000 B.C. but later fell back to from 20 to 30 per cent. Fir decreased to 2 per cent by 5000 B.C. but increased to 20 per cent by 1000 A.D. Hemlock increased to from 10 to 20 per cent by 4000 B.C. A species of walnut occurred in western Nova Scotia about 4600 B.C., reaching 4 per cent of the total pollen count by 3000 B.C.

A holly pollen was found at a depth of seven metres (circa 1900 B.C.) and occurred intermittently to the highest bog level; this, however, was probably pollen of the inkberry—the shrub which still exists in western Nova Scotia—rather than that of the holly tree, which now occurs from Massachusetts southward.

Pollen studies in Cape Breton were conducted in a bog near Glace Bay, a bog at Margaree Forks, and another at an elevation of about 800 feet between Cape North and Neil Harbour.[6] The oldest pollens found were near Glace Bay and are believed to have developed circa 4300 B.C., probably 3,000 or more years after the glacier was gone from that area. Spruce then comprised 22 per cent, increased to 52 per cent by 3700 B.C., decreased to 14 per cent by 400 A.D. and reached 34 per cent circa 1000 A.D. The pine pollen distribution ranged from a low of 11 per cent about 4300 B.C. to a high of 36 per cent by 700 B.C. and declined to 16 per cent circa 1000 A.D.

Surprisingly, considering its current predominance in Cape Breton, balsam fir comprised less than 27 per cent of the pollen mix at any time in any of these three bogs. It attained its highest level at Margaree Forks about 400 A.D. and then decreased to 22 per cent. Hemlock pollen counts were from 1 to 9 per cent consistently in all three bogs, except for highs of 25 per cent circa 3100 B.C. and of 31 per cent about 2500 B.C. near Glace Bay. The birch was highest of the Cape Breton pollen counts, comprising 49 per cent of the total found circa 4300 B.C.; it fell to 5 per cent from 3700 to 3100 B.C. and then ranged fairly constantly between 16 and 44 per cent in all three bogs after 2500 B.C.[7]

Beech pollen did not appear in Cape Breton until about 1900 B.C. and did not reach more than 2 per cent in any of the three bogs at any time. Oak comprised only 1 to 2 per cent intermittently a few times after 700 B.C. Maple counts never reached more than 2 per cent in any of the three bogs and were absent most of the time. A little elm pollen was found near Glace Bay around 4300 B.C. and at Margaree Forks about 2500 B.C. but at no other time. Basswood or linden pollen was found once near Glace Bay. Little or no tamarack pollen was found in any of these studies, nor was any from maple, cedar and some other species.

Although not found in these studies, tulip-poplar, *Liriodendron tulipifera L.*, did occur at Margaree Harbour. The author and Dr. R. E. Balch found a fossil tree of this species in 1958, and it was radiocarbon dated at Acadia University to circa 8000 B.C.

The species of walnut closest to Nova Scotia now is butternut, *Juglans cinerea L.*, which occurs in southern New Brunswick, thence southward and westward. Black walnut, *J. nigra L.*, is found from western Massachusetts southward and westward. The basswood or linden tree is now native to the northeastern states of the United States and southern Canada but not to Nova Scotia. The tulip-poplar tree is now native to Massachusetts, thence southward and westward. All of these now exotic species would thrive along the western shore of Nova Scotia and some would tolerate the climate of western Nova Scotia and along the eastern shore. In fact, a few tulip-poplars and many basswood or linden shade trees now exist in Nova Scotia—exotics that have been planted here.

CHAPTER 3

THE COMING OF MAN

Not long after the northward march of tundra reached central Nova Scotia, caribou were present in large herds. As taiga followed the tundra, people followed the caribou. One of the most interesting archeological finds in eastern North America was made at Debert, Nova Scotia, in 1963 and 1964. Concentrations of artifacts, chipping debris and firepits, with dates averaging circa 8600 B.C., dot a wide area overlooking what was then a vast plain. Around that time, this area was less than 60 miles from the southeastern edge of the glacier and great herds of caribou ranged the plain. Most of this plain is now covered by the waters of Minas Basin.

Although there has been some evidence in recent years that people may have been in America before 25,000 B.C., it is generally accepted that the first people to live in North America were descendants of Asians who wandered across from Siberia to Alaska by an isthmus connecting these points of land. This isthmus, at one time up to 1,000 miles wide, existed most recently between about 25,000 and 16,000 B.C. During that period eastern Siberia, most of Alaska, and the western part of the Yukon Territory were free of glaciation. This migration from Asia was a gradual intermittent movement of people seeking food more easily attainable than in their native habitat.

The discovery of man-made tools in the Yukon Territory, radiocarbon dated to circa 25,000 B.C., tends to confirm this migration which started before that time. Bones of caribou and woolly mammoth found with the tools indicate the success of the migrants in their new homeland.[8]

PALEO INDIANS

The immigrants who moved southward, called Paleo Indians, had times of great difficulty, for glaciers up to a mile thick covered most of Canada and the northern U.S. until circa 16,000 B.C. These glaciers had receded only a little north of what is now the Canada-United States border by 10,000 B.C. For several centuries, however, there appears to have been a corridor through these glaciers along the east slope of the Rocky Mountains which permitted the southward movement of these hardy people. Findings of man-made implements, radiocarbon dated at various periods after 25,000 B.C. in many parts of America, indicate that these immigrants spread south, east and again north after crossing from Asia. The spread northward followed closely after the recession of the glacier, the first in what is now Canada being into Nova Scotia.

Little is known of the use of wood by the Paleo Indians. The only artifacts found that were shaped for attachment to wood were projectile points and stone drills turned or spun by hand.

Nothing is known of the people of Nova Scotia from 8000 to 3000 B.C., although it appears that many were descendants of the Paleo Indians. Apparently Inuit also lived here prehistorically.

By 3000 B.C., the tools of the Indians had improved considerably. Though still made of bone and stone, they were more carefully fashioned and better shaped for their uses. Many, such as what we call axes, adzes, and crooked knives, were shaped for hafting to wooden handles. These were crude instruments by modern standards. Most projectile points, scrapers, and knives were made of flaked chalcedony, flint, or other hard brittle stone, while axes, adzes and gouges were made by grinding basalt, quartzite, felsite and other igneous rock after the pieces of rock had been roughly shaped by being broken with heavy stones.

According to the Icelandic sagas, the natives had skin or bark canoes, wooden paddles, bows, arrows, and other implements made of wood or partly of wood circa 1000 A.D.[9] Judging from artifacts found in shell heaps along the coast and at campsites and lakes and rivers inland, they apparently lived in much the same manner in 3000 B.C. as in 1600 A.D. They generally spent their summers at river and stream estuaries in bays and harbours, and their winters inland. Finds in shell heaps indicate that their diet included moose, bear, beaver, dog or wolf, raccoon, porcupine, woodchuck, hare, muskrat, squirrel, whale, seal, walrus, birds, fish and large amounts of shellfish. Although prehistoric Indians practiced agriculture extensively in some parts of America, in Nova Scotia they raised only a little corn and beans.

Besides great numbers of salmon, trout, bass, shad, alewives, eels, and smelt in the rivers and harbours in their respective seasons, two species of sturgeons came to the river estuaries. The larger species grew to 12 feet in length and to a girth of the body of a mature sheep. Brought to the surface by firelight and birchbark torches at night, they were speared by the Indians.

Waterfowl, shore birds and marsh birds, including ducks, geese, swans, willets, plover, yellow legs and curlew were so plentiful that, when disturbed, their flights darkened the skies. Upland game birds, mainly grouse and passenger pigeons, were also numerous in some areas.

The main source of food for the Paleo Indians was apparently caribou. However, as the climate moderated following the glacial age, moose became the continual big game occupant of Nova Scotia. Caribou and white-tailed deer populations see-sawed with the climate; caribou populations decreased as the climate grew warm and white-tailed deer numbers declined when it cooled.

In the wintertime the Indians travelled on snowshoes in the deep snow and used dogs to hunt moose and deer. In the mating season of the moose, bull moose were lured within bow and arrow range with calls amplified by birchbark horns. The Indians hunted or fished only as they needed food or pelts for clothing.

It is interesting to note that these early inhabitants probably used a drug that we consider to be of relatively recent origin. However, according to Arthur Freese, "Aspirin is one of the very few drugs that spans man's whole history from the Stone Age to the Space Age. Salicylates were used by earliest man in various forms (chiefly derived from parts of the willow tree) . . . . Socrates prescribed willow leaves for the pain of childbirth and Roman soldiers used willow bark to treat fever and pains. The first American settlers found Indians using willow for their lumbago, fevers, and headaches."[10]

MICMACS

The Indians who live in Nova Scotia are descendants of the Micmac tribe of the Algonquian linguistic stock. In a number of confederate bands, the Micmacs also occupied the Gaspé Peninsula, northern New Brunswick and Prince Edward Island. They depended on the forests for most of their food, clothing, shelter and transportation. As there were only several thousand in all Nova Scotia, however, their utilization of forest products was not extensive.

Prior to the early 1600s, the Micmacs used bone and stone knives to cut their meat. Their fish and meat were mostly roasted or boiled, and sometimes fried in seal oil. Although pieces of pottery have been found in shell heaps and middens in many places in Nova Scotia, the pottery was of poor quality and quite fragile. It appears to have been used mainly for carrying liquids and not for cooking. Their "pots," used for boiling and frying food, were fallen trees with basins gouged into their top surfaces by alternate burning and chipping with stone axes, adzes and gouges. The water or seal oil was heated in these basins by immersing stones that had been heated in fires.

The Malicetes (who occupied the Saint John River Valley, northern Maine and southern Quebec) and the Micmacs are the only Indians known to have used cutting tools drawn towards the user: the adze, the gouge and the crooked knife. These tools are believed to have been copied from those of the Inuit, who had used similar draw or pull tools long before they or the Indians came to Nova Scotia.

The adze and the gouge were hafted to wooden handles with the blade perpendicular to the handle. Modern artisans still use the adze in building wooden vessels and in other carpentry work, although this tool is no longer common. The crooked knife was a unique tool. Its name is derived from the crooked handle, for the three- to four-inch blade is straight. The Micmac Indians made their handles from deer or caribou antlers, split or notched for hafting the blade. The Indian crooked knife blade was fashioned from flint or chalcedony and had a flat surface on one side with the other bevelled. (Many woodsmen other than Indians have made and used crooked knives until recent times but their blades had the same bevel on both sides and the handles were mostly hard maple.) The handle was made so that the user's thumb fitted into the curve with the straight part of the handle gripped by the four fingers. These knives had many uses but the main ones were for making shavings for starting fires, shaving wood for other purposes and for splitting wood into slivers and then strips for basket weaving, canoes and other purposes.

The Indians had many children but infant mortality was high. The women did most of the domestic work, even carrying home the game killed by the men. Groups of families lived in communities in birchbark wigwams, one or two families to each wigwam. When game or other food was depleted the group would move to a new location, sometimes up to 60 miles away. Most movements were dictated by the seasonal migration of fish and game and by the ripening of fruit and nuts in various localities.

The wigwam bark, sewn edge to edge with black spruce roots, was taken from large white birch trees. The men made the canoes and snowshoes and supervised erection of the wigwams. Everyone slept on their wigwam earth floor or fir boughs covered by animal skins or on mats of woven rushes. Their fuel was wood—mostly dead tree branches easily broken—although larger chunks were burned too.

Most canoes were made of birchbark stretched over thin split cedar slabs and with cedar or ash ribs and gunwales. As with the wigwams, the bark was sewn edge to edge with black spruce roots as big as the little finger or smaller. Seams were covered by spruce gum chewed and heated to soften it. The gunwale ends were pegged and lashed with roots, and thwarts or seats were pegged to the gunwales. Some canoes carried as many as 10 people. Sails of moose skin were used at times, but the main source of propulsion was the men using paddles made of beech. When birchbark was not available, they used hemlock bark for canoes and wigwams.

Even with their crude tools, the Micmac learned to split the wood of ash trees into thin strips which were woven into baskets of various shapes and sizes. Pack baskets, though less common in Nova Scotia, were used extensively in New England and the Adirondacks of New York State up to 1940. They were made of heavier strips of ash wood and fitted with shoulder straps and tumplines. The latter, a leather strap fastened to a pack basket or a load and arranged over the head with the load high on the back, is undoubtedly the most efficient way of carrying a heavy load by a person afoot.

Women and girls wore well-dressed moose skins to below the knee. They had beaver robes in winter and, in fact, used the pelts of most furbearers. In mild weather Micmac men wore only loin cloths and moccasins lined with dry grass; in cold weather they dressed in leggings and hip-length robes. Skilled in curing and tanning pelts and hides, they used brains and livers of birds and animals to make pelts soft and pliable and they finished their buckskin process by smoking the hides.

These Micmacs were the forest dwellers found in Nova Scotia by the Europeans of the 1600s. Before the Europeans arrived most Indians who survived infancy lived long, happy and respectable lives, almost entirely free of disease. The Europeans brought them chicken pox, tuberculosis, smallpox, venereal diseases and alcohol, all of which proved disastrous to the natives.

INUIT

Although David Damas, in his article "Nomads of the North,"[11] indicates that Inuit reached Greenland about 2000 B.C. and roamed as far south as Labrador, it appears that they also occupied parts of Nova Scotia from prehistorical times until the early 1700s. Most archeologists believe that their original home was the Bering Isthmus or so-called land bridge which was slowly flooded as the oceans rose between 15,000 B.C. and 8000 B.C. With this flooding, some of the Inuit moved westward to the northeastern coast of Siberia where their descendants still live. Most of them moved eastward to America and gradually spread out in small groups along the north coast and islands of North America, some of them ultimately reaching Nova Scotia.

Whether the Inuit were here before the Paleo Indians is not known. However, the tradition of the Micmacs is that when their forebears came to Nova Scotia from the south, they found a "small people" whom they called "Bo-ne-ya." Their tradition further indicates that they drove these small people northward off this peninsula. In his *Histoire et description générale de la Nouvelle France,* Pierre François Xavier de Charlevoix described the Micmacs in coastal New France in his time, 1705-1709, as maintaining a constant war with the Inuit in Acadia and driving them northward. Lescarbot, in his writings of the 1600s, also mentioned that Inuit were found in Nova Scotia. Harpoon heads of walrus ivory and other tools, typical of the Inuit, that have been found in Nova Scotia are further proof that they once lived here. They lived in huts of sod and stone along the coast, depending largely on the sea for their livelihood.

VIKINGS

Vikings living along the southwest coast of treeless Greenland had been greatly impressed by driftwood that was washed ashore. They believed this wood came from forested land to the southwest of their settlements; this belief prompted exploration in that direction. The driftwood, in fact, had been carried from Alaska and Siberia by the Arctic Current, around Cape Farewell and up the west coast of Greenland by the West Greenland Current.

Although there is now some doubt that Norsemen reached Nova Scotia circa 1000 A.D., descriptions in Icelandic sagas of the lands discovered by such men as Biarni Heriulfson, Leif Ericson and Thorfinn Karlsefni bear a striking resemblance to the province's coastal areas.[9] The seafaring Norsemen of that time had no nautical instruments to guide them and, apart from knowledge of landmarks, depended solely on the position of the sun and the stars, the days and estimated speed of sailing for their knowledge of locations.

Their descriptions and relative positions of the rocky shores and mountains of Helluland, the low wooded land and numerous sand beaches of Markland, with the strong tides in the part they called Straumfiord, and the grapes they found on the coast of Vinland appear to correspond to parts of Labrador and Newfoundland, Nova Scotia and the New England coast, respectively.

According to the sagas written by Icelandic priests—from accounts given by men who had been on these voyages—there were several expeditions to Markland (Nova Scotia) and Vinland (New England), and an attempt was made in 1020 A.D. to establish a permanent settlement at Straumfiord (Inlet of the Currents or Tides) in Markland. Karlsefni's son Snorri was born there that fall, apparently the first white child born in America. Numerous cargoes of timber were shipped by the Vikings in their knarrs (cargo ships) from Markland to Greenland—the first export of Nova Scotia forest products.

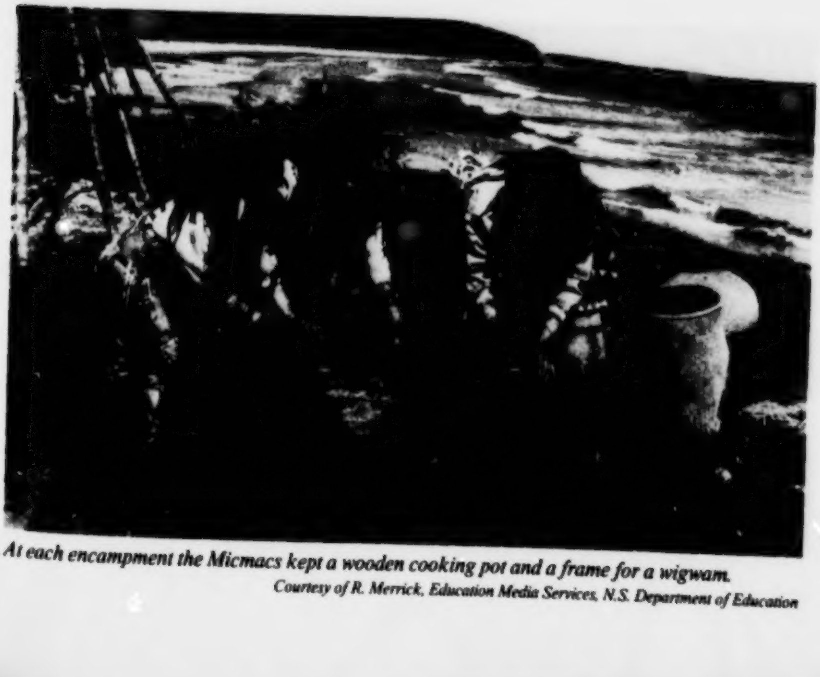
South of Straumfiord, contact was made with large numbers of Indians. At first all was peaceful and bartering was carried on, but then hordes of Indians attacked the Norsemen, who realized that they must live in a continual state of warfare if they wished to stay here.[9] These settlers left the new land in 1023, and no further attempt to settle permanently was recorded.

According to sagas, the Norse connection with Markland lasted nearly 350 years; however, this was mainly in the form of occasional voyages to transport timber to Greenland.[9] They liked what they found in Markland and

Vinland, and they probably would have settled here permanently had there been no warring inhabitants. Although the Norsemen were aggressive and warlike too, they were vastly outnumbered by the people they found here, who had weapons almost as efficient as their own.

Other Vikings who came to America are mentioned briefly in the sagas, and traces of their presence still remain. The ruins of a Viking settlement have been found at L'Anse aux Meadows about 15 miles north of St. Anthony, Newfoundland. A small coin found in an Indian midden at Blue Hill Bay in Maine in 1961 was identified by a leading expert on Viking coins, Dr. Kolbjorn Skaare, as being a genuine Norse penny struck in Norway between 1065 and 1080 A.D.[12]

After the last ice age, the climate in the northern latitudes gradually grew warmer and, between 800 and 1100 A.D., was comparatively mild. The Norsemen sailed the North Atlantic and founded colonies in Iceland, a then greener Greenland, and, for a while, northeastern America. But the cold returned around 1300 A.D. in the Little Ice Age, and before 1400, pack ice blocked travel between Iceland and the Greenland colonies. Scurvy was rampant in these colonies, and by the late 1400s most of the people had died—all except those who had intermarried with Eskimos. In 1910, the explorer Stefansson found blond Eskimos, believed to be descendants of Greenland Vikings, on Victoria Island.



At each encampment the Micmacs kept a wooden cooking pot and a frame for a wigwam.

Courtesy of R. Merrick, Education Media Services, N.S. Department of Education

3 THE SEVENTEENTH CENTURY

This is the forest primeval. The murmuring pines and the hemlocks,
Bearded with moss, and in garments green, indistinct in the twilight,
Stand like Druids of eld, with voices sad and prophetic,
Stand like harpers hoar, with beards that rest on their bosoms,
Loud from its rocky caverns, the deep voiced neighbouring ocean,
Speaks, and in accents disconsolate answers the wail of the forest.

(Henry Wadsworth Longfellow, ***Evangeline****)*

CHAPTER 4

THE BEGINNING OF LUMBERING

When the French established Port Royal in 1605, they were confronted mostly by the primeval forests which included— besides Longfellow's pine and hemlock—cedar, spruce, fir and a number of species of hardwoods. Most of the forests were indeed primeval, although there had been some forest fires. In his book published in 1672, Nicholas Denys wrote that thunderstorms often occurred and that some of these burnt 10 to 15 leagues (30 to 45 square miles) of country.[13]

Although the early French homes were generally log huts with thatch roofs, the habitation at Port Royal was built mostly of timbers squared by broadaxes. The fort and habitation were originally at the site of what is now the Port Royal National Historic Park on the north side of Annapolis Basin, five miles west of present-day Annapolis Royal. America's first waterpowered grist mill was built on Allains River at Lequille, 1 1/2 miles south of Annapolis Royal, and there was a considerable French settlement at that place by 1612.

At Port Royal the French and the Micmacs built strong friendships. Membertou, chief of a band of about 100 Micmacs, was baptized there with his family in 1610. They were the first Indian converts to Christianity in what is now Canada. This friendship was of great value to the early settlers for, although there was an abundance of fish and game at times, the French knew little about taking game during lean times. The Indians showed them how to obtain and store food for times of scarcity.

During the 1600s, the trade axe was the tool used for felling and cutting trees into logs and fuelwood in Nova Scotia. The Indians were delighted to trade large quantities of valuable furs for those axes, a great improvement over their stone axes which required so many laborious hours to make. The trade axe had a straight handle hafted into an iron or steel head. It was a crude tool with a straight cutting edge, poorly balanced, and it had no poll or head. (See diagram of axes.)

In 1613, the Port Royal Settlement was destroyed and the French were removed by Virginians under Samuel Argall. Between 1605 and 1710, when it was finally taken by New Englanders, Port Royal changed hands between the French and English five times. It was occupied by the English from then on.

During one interlude 70 British settlers attempted to spend the winter of 1629-30 at Port Royal. Thirty died of scurvy and other diseases and the remainder were killed by Indians, except one family which intermarried with the Indians. This ended the first British attempt to colonize Nova Scotia.

Other early outposts were established by the French, by Charles de la Tour near Cape Sable, and some settlements near what is now Yarmouth. These were mostly destroyed by New Englanders after the arrival of the *Mayflower* at Plymouth Rock in 1620. By 1627, la Tour's settlement was the only post of any strength left.

The Indians hated the English at Port Royal because they had taken away the French. With the co-operation of the Indians, these English settlers, who knew little or nothing of coping with the difficult frontier life, would probably have survived in good health just as the French settlers had before them.

In 1632, the Treaty of St. Germain gave all Acadia to France. Under the Great Company of New France Isaac de Razilly, appointed Lieutenant Governor, set up his capital and fort with 40 families at what is now LaHave on the west bank of the lower LaHave River. A cairn marks this location. Around 1635, Nicolas Denys, a close friend of Razilly's, built a home across the LaHave River from Razilly's fort at what is now Riverport. With 12 men working for him, they set up two or more pit saws. It is not known whether these were manually operated or waterpowered. Many pit saws were operated by manpower with one man standing on the log, which had been hewn square, and another in the pit beneath it at the handle at each end of the long saw, working it up and down. However, waterpowered pit saws appeared in Europe in medieval times and a number of these were in operation in Nova Scotia and other parts of America in the 1600s and 1700s.

America's first sawmill, a waterpowered pit saw or whip sawmill, had been built at Lequille in 1612. It used a large web saw (a flat, straight steel blade toothed along one edge) for sawing logs lengthwise into lumber. In such mills the saw was fastened in a heavy wooden frame or gate that moved up and down in wooden slides fastened to heavy posts. Power was conveyed from a waterwheel to the saw by a long pitman or rod connected with the shaft in the waterwheel. Oak was abundant in the LaHave River area then, and the mills produced sawn planks and barrel staves from it. For two years, Denys loaded lumber for France on all vessels bringing provisions for Razilly's men and colonists. This was the first commercial lumber operation in what is now Canada.

But Razilly died and was replaced by Sieur d'Aulnay de Charnisay who persecuted Denys and the settlers along the LaHave River so that most of them left about 1637. Denys then removed to Saint Pierre (now St. Peters) in Cape Breton where he built a fort in 1650. He also made the first good road in Canada, about a half mile long, near the present St. Peters Canal. It was used for hauling boats and small vessels by ox teams between St. Peters Bay of the Atlantic Ocean and St. Peters Inlet of Bras d'Or Lake. In the winter of 1668 fire destroyed Denys's trading post and he moved to Nepisiguit (now Bathurst, New Brunswick).

Nicolas Denys was Governor of Cape Breton Island, Prince Edward Island and the coast from Canso to Gaspé from 1654 until his death in 1688. He explored much of the coast of Nova Scotia and parts inland as well, and his descriptions of the forests provide most of the information we have now of the forests in the 1600s. Oak (red oak, *Quercus rubra* var. *borealis*) and white-cedar were more common then than now and a much higher percentage of the forest was white pine and red pine. In 1633, Denys named the tree species as "oak, pines, firs of three sorts [spruce, fir and hemlock], birches [white birch], black birches [yellow birch], beeches, aspens, maples and ashes." He wrote that he found "grapes and butternuts or walnuts at Annapolis Basin." Lescarbot had also said that he had found grape vines near Port Royal in 1606.

East of what is now Lunenburg Denys found, in 1655, "only firs [spruce] along the coast." Towards Jeddore, he wrote of "woods of all kinds, with less firs and more pines. The islands [Ship Harbour to Liscomb] are covered with little firs, very low and much branched [cat spruce]." On the mainland in this area he found many Indians and many moose. Large firs [spruce] were found at the Strait of Canso and more cedars and poplars at Havre Boucher. At Antigonish, he described "fine trees, large and very tall, intermixed with oaks and some pines." His report continued: "All around Labrador [Bras d'Or Lake] is bordered with mountains, a part of which are plaster [gypsum]. The land is not very good, although the hills are covered with trees of which the greater part are pines and firs mingled with birches and beeches." From Cape North to Cheticamp, he described "firs intermingled with some little birches," and near Mabou, "wood of all sorts such as ash, birch, beech, maple, pine and fir, but none of these are of the finest."[13]

From Cape George to Pictou, Denys found "land covered with fine trees, tall and stout, of all the kinds already named amongst which are quantities of oak," and at Pictou, "All the trees are very fine and large. There are oaks, beeches, maples, black birches, cedars, pines, firs and every other kind of woods. Seven or eight leagues up [East River, Pictou], there is a little island covered with the same woods and grape vines. The land on both sides of the river towards its source is covered with large and small pines for a league. The land and trees are better inland where the beeches are large in height and thickness."[13]

On average, tree sizes reached by most species in 1600 were much greater than they are now; the forests had not nearly the variety of enemies that now occur in Nova Scotia. Although the spruce budworm and a number of other endemic species of insect and fungi were likely here prehistorically, many of the forest pests here now have been accidentally introduced from other parts of the world.

Denys also described the succession following clearing of the forest lands. "There are raspberries in all the places deprived of their woods and also in clearings. If one of the latter is left a year without cultivating, it fills up with raspberry bushes. The berries are very large, of very good taste and better than those of France. It is troublesome to clear the land of them. If, after having removed them, the land is not cultivated and sown, it produces hazelnut bushes and these nuts are good. Remove the hazelnut bushes and do not cultivate, the land reverts to woodland."[13]

Denys described Acadian animal life in considerable detail.[13] Around 1660, the gray seal and the harbour seal landed in herds of 200 to 300 in some places. At that time, the walrus occurred along the Gulf of St. Lawrence coast and occasionally along the Atlantic coast of Nova Scotia, as well as on Sable Island.

Moose, black bear, porcupine, marten, squirrel, weasel, mink, rabbit [varying hare], fox, Canada lynx (*loup-cervier*, later called "Lucifer" by the English settlers), wolverine (*quincajou*), and snakes were plentiful. There were, however, no poisonous snakes. Black foxes were rare, but there were some that were black mottled with white, some gray mottled with white, some all gray and many all red. Denys mentioned that foxes tolled (lured within killing range) ducks and geese. He also stated that wolverines climbed trees and dropped on the backs of moose to kill them.

Squirrels were the red and flying varieties, and there were chipmunks. Besides the birds mentioned in Chapter 1, Denys noted bald eagles, red ruffed grouse, gray ruffed grouse and black grouse. Crows, nighthawks, barred owls, robins, hummingbirds, swallows and woodpeckers, including the red-headed, were numerous. The woodpeckers may have been the downy and/or hairy woodpeckers but they were probably pileated. He noted woodcock (but stated that they were not common) and bats larger than those in France.

Passenger pigeons were as common in Nova Scotia as in most of North America in the seventeenth century, frequenting land covered by raspberries after burning or clearing of forests. Raspberry Island, now called Mosher Island, at the west side of the mouth of LaHave River, was covered by huge flocks of the pigeons when the berries were ripe. Here and elsewhere the settlers of New France killed these birds for food by the thousands with sticks as they flew by in large flocks, low over the land.

> At the beginning of the 19th century there were between three billion and five billion passenger pigeons in North America but all were destroyed. W. A. Purcell, a Halifax taxidermist, stated that passenger pigeons were plentiful near Halifax about 1846 but they disappeared about 1850. One was shot in Halifax at Northwest Arm in 1857 and John F. Tufts, father of Robie W. Tufts, saw three shot out of a flock of about twenty near New Albany, Annapolis County that year. The very last one in the world died in 1914 at the Zoological Garden of Cincinnati, Ohio.[14]

Although large numbers of moose had been on Margaree Island in the first half of the seventeenth century, most had been killed by Indians before 1655. By 1908, moose were once again plentiful on that island. Denys stated that though moose had once been plentiful on Cape Breton Island, they had been destroyed by the Indians.[13]

As the century drew to a close, sawmills began to appear in various parts of the province. By 1690, St. Castin, Annapolis County, had two or more sawmills; and in 1699, when Diereville visited Port Royal, there were two on Allains River. That same year there was also one at Minas and another one scheduled for construction. These mills had pit saws. It is not known whether they operated by manpower or waterpower, but at least those at Allains River must have been waterpower mills.

Masting was started in Acadia just before the turn of the century. In 1700, 30 or 40 pine masts were shipped on the vessel *Avenant* from Port Royal to France. Denys earlier stated: "All the masting which occurs in New France from LaHave to the mouth of the great river of Saint Laurent is not good because it has a coarser grain than that which occurs at Port Royal, on the River Saint Jean, or on that of Pentagouet, which is the best of all."[13] Had he searched several miles inland, Denys would have found excellent pine, though few suitable for masts, in some places east of the LaHave.

4 THE EIGHTEENTH CENTURY

Against the backdrop of the forest, the eighteenth century unfolded in Nova Scotia. It was to be a century of immense growth for the province. Various waves of settlers came, bringing with them rich heritages and new ideas. Roads opened up the interior and the lumbering and shipbuilding industries began to flourish. Legislation was enacted not only to preserve the finest white pines for the masts of the Royal Navy but to regulate the export of forest products and to protect wildlife.

CHAPTER 5

THE STRUGGLE FOR CONTROL

To strengthen their hold on the entrance to the St. Lawrence River, the French built a supposedly powerful fort at Louisbourg in Cape Breton between 1720 and 1740. In the summer of 1745 New Englanders captured the fort, which had been poorly constructed and inadequately supplied. By the Treaty of Aix-la-Chapelle, England returned Louisbourg to France in 1748, against the wishes of the New England colonists. To meet their demands for protection against the French, England built a fort at Chebucto (Halifax) and moved the English troops, then occupying Louisbourg, to the new fort in 1749.

To encourage settlement at Chebucto, the English government promised a civil government with "proper measures for their security and protection," 50 acres of land to every qualified settler plus 10 acres for every member of his family, together with arms, ammunition and "a proper amount of materials and utensils for husbandry, clearing and cultivating land, erecting habitations, carrying on the fishery and such other purposes as shall be deemed necessary for their support."[15] Officers below the rank of ensign were to be given 80 acres, ensigns 200 acres, lieutenants 300 and captains 400. Every officer above the rank of captain was promised 600 acres with an additional 30 acres for each member of his family. All were promised rations for one year after arrival in Nova Scotia.

Most applicants were the poor cockney of London; others included about 50 army officers and a few adventurous gentlemen. Col. Edward Cornwallis, a fine incorruptible man in a period of great corruption, was in command at Chebucto. He had had a sawmill built at the cove near Dartmouth in 1749; later several windpowered sawmills were built at Dartmouth along what is now known as Windmill Road. The first shipment of mast timber from Nova Scotia for the Royal Navy consisted of several large pines sent from Halifax to Portsmouth, England on the *Osborne*, a galley launched at Halifax in 1751.

In 1750 and 1751, the English government assisted in the immigration of foreign Protestants. Three hundred came in 1750 and 1,000 in 1751 from the Palatinate and the upper Rhine of Germany. These Hanoverians were taken in 1753 to Lunenburg, where they were granted land and given seed, grain, tools, building supplies and arms. Land was granted to them by drawing playing cards. Those drawing aces and face cards got the best choices, and those drawing deuces and treys received the poorest. By 1754, five waterpowered sawmills were operating around Lunenburg.

In 1755, Admiral Winslow's British transports sailed up the Annapolis River and removed about 1,650 Acadians. Ordered by Nova Scotia Governor Lawrence, this was the Expulsion of the Acadians upon which Longfellow's poem *Evangeline* is based. Although some Acadians, particularly LeLoutre and several other priests, did all they could to secretly oppose the British after 1710, most of them did support the British and co-operated with them. Many, however, refused to take the oath of allegiance to the British king lest they be called upon to bear arms against other French settlers.

Lawrence's object was to extinguish the Acadians as a people. Families and friends were separated and scattered widely throughout the American colonies. About 500 of the Annapolis Valley Acadians, aided by Micmacs, eluded the British and hid in the forests until 1764 when Governor Michael Franklyn permitted exiled Acadians to return and settle on lands granted to them in Clare Municipality in Digby County. Former Acadian lands in Annapolis Township were divided into lots for the new English settlers in 1760 and 1761. Each settler was allotted a woodlot of 500 acres and an equitable portion of cultivated marsh and upland.

Meanwhile, in 1756, the British took the French settlers from Port La Tour on the South Shore to Boston and destroyed their homes. Practically all the French from Pubnico to Yarmouth (151 people) were removed to Halifax in 1758, then to England in 1759, and thence to France. In the same year as the Acadian Expulsion, Captain Willard's troops drove the Acadians out of their Tatamagouche and Cobequid settlements, in what is now Colchester County, and burned their homes and barns. Government vessels brought settlers from Massachusetts in 1761 to occupy the good agricultural land from which the Acadians had been ousted along the shores of Cobequid Bay. Londonderry Township was first settled in 1762, mostly by people from northern Ireland.

Louisbourg finally fell to a British fleet and an army of New England colonists in 1758 and was destroyed. Quebec was taken by Wolfe's forces in 1759. With the passing of all Canada to Britain by the Treaty of Paris in 1763, settlement of Nova Scotia was accelerated, mostly by New Englanders, as well as by Scottish, Irish and English immigrants and by returning Acadians.

In 1776, about 60 of the Acadian families earlier exiled from the Annapolis Valley found each other and walked through the forests from Boston around the shore of the Gulf of Maine and Fundy Bay, over 1,000 miles, to return to their beloved Acadia. On arrival, they were required by the

English authorities to move on to Clare, in Digby County, where they were given land grants. Of the French settlers taken to Boston from Port La Tour, a remnant returned in 1767 and were given grants in the Pubnicos and near what is now Yarmouth.

The expulsion of the Acadians.

Courtesy of Dusan Kadlec and Parks Canada.

LAND GRANTS

Starting in 1759, Britain made extensive efforts to colonize the province, relying heavily on land grants to attract prospective settlers. Each grant, often consisting of 100,000 acres, was given to a large number of settlers collectively.

The major English settlement of central and northern Nova Scotia started after the granting of land to such speculators as Alexander McNutt of Ireland. Tracts comprising 160,000 acres were reserved for this gentleman and his associates in 1761. The grant to McNutt et al. was in eight grants nominally of 20,000 acres each, though they were really much larger—covering the eastern half of Pictou County. One of these was made to John Wentworth, then Governor of New Hampshire. In 1778, all of these grants except Wentworth's were escheated (reverted to the Crown when there were no legal heirs). In 1761 a grant of 180,000 acres for the Philadelphia Company was made to Edmund Crawley and 13 others residing in Philadelphia. This included the greater part of Pictou Township and a large part of what is now Colchester County. In 1765, Col. J. F. W. DesBarres, a native of Switzerland who had trained as a military engineer and served with Wolfe at Louisbourg and Quebec, obtained a grant of 20,000 acres in the Tatamagouche area. He moved Swiss settlers who had settled at Lunenburg with the Germans in 1753 to his new grant. As water was the main means of travel and transportation, these early townships, grants, and locations were situated on or near the seashore or based on strategic rivers and streams.

The early townships were made up of shares or "rights" consisting of 500 acres in one or more lots. Each settler, depending on his standing in the community, was granted one or more of these rights. The government of the day made no provision for their division, which was left to the settlers themselves or to their Proprietors' Committees, appointed for this and other purposes. In nearly every township there was a different division of these "rights". In the township of Truro, the right consisted of a town lot, a marsh lot, a farm lot, and a woodlot; whereas in the Liverpool township, a right consisted of a town lot, a salt mess, a fish lot, a 5-acre lot, a 12-acre lot, a 30-acre lot, a 200-acre woodlot, and a 250-acre lot of undivided or common lands. Others again, as in Yarmouth, were divided into town lots, farm lots and first, second and third division lots.

At the time of the grant, the exterior boundaries were surveyed. Shortly afterwards the town and farms lots, which were of primary importance, were also surveyed. Other sections— particularly the woodlots, which were in the rear and considered to be of very little value—were often left to a much later date. All land boundary surveys were done by magnetic compass. The common practice was to combine a number of lots, generally adjoining a river or seashore, and run back to a common baseline. Some of these lots extended back for a distance of four or five miles, as in the Parrsboro shore grant. In other cases they were divided as rectangles or parallelograms, but invariably were given a number on a plan. In subsequent conveyances, these numbers were referred to in lieu of a detailed description. In many cases, these plans have either been destroyed by fire or lost. As the lots were not otherwise described, this presents the present-day surveyor with a major difficulty of retracing.

Early surveyors were appointed by the government with a title of Deputy Surveyor, under the Surveyor General, and were accepted by the proprietors of the various townships. Some of these appointees were good ones. Some so appointed were, however, woefully lacking in experience and training in the art of land surveying. In many cases, these men apparently were seamen who used marine compasses; quite often the bearings they gave were in marine terminology as north, northeast, east by northeast, and so on.

The surveyors' returns, filed in the vault of the Department of Lands and Forests, describe the conditions under which land surveyors worked. In early times rum was legal tender in Nova Scotia, and axemen and chainmen employed on surveys commonly were paid so many shillings and so many gallons of rum. Ten shillings and two to five gallons of rum appears to have been a normal ration. The list of supplies taken into the field by a surveyor included rum and gin, as well as tea, sugar, molasses, salt, flour, cornmeal, salt pork, salt beef and potatoes.

On the plan of survey submitted with the early surveyor's return, it was not uncommon to find an "X" at some point on a boundary line with the notation "Here we buried ye bottle." This may explain in part the overrun often found in some boundary lines; woodland values were low and surveying was often done carelessly. It was common practice to skip the tally of several chains or more in measuring where bogs or barrens were crossed. Some land grants contain four times as many acres as stated in the grants and some contain less than stated. The average excess appears to have been about 12 per cent.

BROAD ARROW POLICY AND FOREST LEGISLATION

Most early grants reserved all pine trees according to the Broad Arrow Policy of England. Fearful of European wars closing access to Baltic timber, England had initiated the "Broad Arrow" policy when William and Mary came to the throne in 1688. It was stated as part of the New Massachusetts (and Maine) charter in 1691 and applied in Nova Scotia in 1728. That year, the Surveyor of Woods in America was ordered to enforce the act for preserving white pine in Nova Scotia, 24 inches in diameter and larger, 12 inches from the ground, that were suitable for masts. Trees of that specification that were not on private property were to be marked or blazed with the Broad Arrow and not felled anywhere without the surveyor's license.

According to W. A. Calnek's history of Annapolis County, Nova Scotia's first Surveyor General was David Dunbar of Piziquid (Windsor), appointed by Governor General Phillipps, September 30, 1730.[16] He started land surveys along the Annapolis River on French and English grants, deeds, and such. At that time the title "surveyor" was used in a more general sense than today. In addition to land surveyors there were surveyors of fences, surveyors of lumber, and others. According to the minutes of his Majesty's Council at Annapolis Royal 1720-1739, David Dunbar was actually Surveyor General of His Majesty's Woods in Nova Scotia. Prior to 1728, it appears that he was Surveyor General of His Majesty's Woods on the Continent of America and lived in New England. His duties were to survey and reserve areas with trees suitable for masts and other ship timbers and to mark trees suitable for masts with the Broad Arrow. However, as stated by Calnek he also did land surveying.[16]

In 1749, Charles Morris, a land surveyor from Massachusetts, was appointed Surveyor General of Nova Scotia. During the next 100 years, four Morrises were to hold the title of Surveyor General. Charles Morris, as Surveyor General, was responsible for surveying the boundary lines of land grants, roads and for conducting any other land surveys that might be required. Maps and plans were prepared under his charge. He also did some of the work of the Surveyor of the King's Woods, marking pine trees for the navy. In 1760, for example, Morris was sent to Mill Village, Queens County, to mark pines suitable for masts with the Broad Arrow. While Morris carried out some surveys himself, deputy surveyors were appointed for each district or county.

In 1758 the Nova Scotia Legislative Assembly first met in Halifax. The assembly started making laws regarding forests and forest products in 1762. An act the year before had an indirect bearing on the forests, as it was designed to prevent damages by unseasonable burning or firing of the woods. From the preamble to this act, however, it is quite clear that there was little concern for damage to the woods, but rather for damage to settlers' buildings and crops due to fire spreading from the woods. The first of the acts in 1762 was "an Act regulating the export of fish and the assize of barrels, staves, hoops, boards and all other kinds of lumber and to appoint officers to survey the same . . . . Boards shall be one inch thick, shingles 18 inches long, at least four inches broad and one-half inch thick at the thick end. Clapboards shall be five inches broad, one-half inch thick at the back and four feet four inches long."[17] In 1772, an act disclosed what merchantable timber was considered suitable for exportation to Great Britain: "No hewn timber shall be deemed merchantable or offered for sale for the British market as such unless the same is found properly squared and not less than ten inches square and free of bark." In 1774 and 1775, legislation was enacted to prevent waste and destruction of pine and other timber trees on certain reserved and ungranted lands in the province. Firewood and underwood that were found within a half mile of the sea and used in fishing were exempted from the legislation.

An act in 1785 confirmed that the British Broad Arrow Law applied here in 1728, but also applied it to land granted after 1785 as well as to Crown land. It reserved "all . . . pine trees 25 inches diameter and upwards at 12 inches off the ground (on lands granted after that time) and if such trees shall be cut or felled without license . . . from the surveyor general of the woods or his deputy or from the Governor of the Province . . . the lot or share of land on which said trees shall be cut, shall be forfeited and the land reverted to His Majesty."[17]

CHAPTER 8

FURTHER SETTLEMENT

The townships of Yarmouth, Barrington and Liverpool, settled mostly by New Englanders, were combined as a county called "Queens" in 1762.[18] Over 7,000 New Englanders had settled in Nova Scotia between 1750 and 1763; Barrington was reported to have 50 families and 500 acres of cleared land by 1763. In 1762, Surveyor General Charles Morris reported that Liverpool had about 100 families of whom more than half were fishermen. The others were farmers who got the principal part of their substance from lumber. The Township of Liverpool was granted in 1764.

Pictou was founded in 1767 by six families who arrived on the brig *Hope* from Maryland and Pennsylvania, sent by the Philadelphia Company. Within a few years the *Hector*, an old Dutch ship in poor condition, sailed from Scotland for Pictou with 33 families and 25 unmarried men aboard. The voyage lasted 11 weeks and 18 people died.

In 1765, Cape Breton was annexed to Nova Scotia, although the Nova Scotia governor was forbidden to grant any Cape Breton land. It was between 1765 and 1767 that Samuel Holland made his reconnaissance of the island. He reported that the woods there afforded "a great quantity of excellent timber." In 1773 and 1774, Surveyor General Charles Morris prepared a report on Cape Breton Island based on that of Samuel Holland; it was forwarded to the English Government by the Governor of Nova Scotia. His report, in part, concerned the forest.

> The island of Cape Breton is principally forest land. Here grow the greatest quantity of a species of Timber called by us Black Birch [yellow birch]. The wood of this Tree is firm, close grained, in color resembling the Mahogany but stronger and more substantial. It is used here in Shipbuilding and has been found to be more durable than Oak, especially for such parts of vessels as lie under water and for plank. It grows in form and shape much like the Oak, in bigness commonly about nine or twelve feet in girth, the main stock grows generally from twenty to thirty feet before it branches, the branches are large at the joining the main stock, making excellent knees. In this island are also great quantities of Black Spruce,—this Tree affords excellent Masts for vessels about one hundred tons and under; it seldom grows above two feet in diameter clear of sap but would serve for Topmasts for capital ships and smaller yards; it is

> esteemed much stronger than Pine, and very little heavier; the Island abounds with other Timber common to the Country.
> I am, therefore, of the opinion that the whole island of Cape Breton should be reserved for the purposes of preserving for His Majesty's use Timber for Shipbuilding and other uses—this Island being the nearest tract of land to England where such quantities of Timber are to be procured and having many excellent harbours for the exportation thereof.

The British government decided to adopt this recommendation and on September 7, 1774, the Secretary of State wrote to Governor Legge of Nova Scotia as follows:

> The Reservation to His Majesty of such part of the province of Nova Scotia as produce Timber for shipbuilding and masts for the Royal Navy is an object of very great importance; and it is the King's Pleasure, upon a full consideration of Mr. Morris' letter to you, that all the Lands upon the River St. John above the Settlements that have been already made upon it, as also the whole Island of Cape Breton should be reserved for those purposes, and no further grants made of any part thereof, nor any wood cut thereupon except for his Majesty's use, under a License to be granted by you to His Officers for that purpose.

This instruction was immediately embodied into legislation by the provincial legislature, in 1774. By this statute a fine of 100 pounds was to be imposed upon anyone found guilty of cutting or carrying off any timber whatever, and the setting fire to, or the laying waste of, these reserves was made a felony. The needs of the fishery in fuel and underwood, however, were exempted for such wood within half a mile of the seashore.

Soon afterwards, events in the Thirteen Colonies caused new instructions to be promulgated with respect to the timber lands of Nova Scotia. On July 1, 1775, on the eve of the American Revolution, Lord Dartmouth wrote to Governor Legge of Nova Scotia asking him to ignore previous instructions in regard to the disposal of Crown lands in the province and to suspend the law in regard to timber reservations. Henceforth, he was to grant lands freely to refugees from the American colonies and to encourage the exportation of timber and coal to the West Indies.

With the arrival of refugees, disbanded troops and Loyalists, the population of Cape Breton Island was increased by about 400, and that of the remainder of Nova Scotia, after New Brunswick and Cape Breton were made separate colonies in 1784, by about 22,000. These new settlers doubled the population of Nova Scotia and provided a substantial nucleus for Cape Breton Island.

In 1783, a fleet of vessels brought some 5,000 Loyalists—legionnaires and their families—from New York to Port Roseway where they established what is now the Town of Shelburne. Within a few years Shelburne and suburbs had a population of over 10,000—the fourth most populous place in North America after New York, Philadelphia and Boston. On the opposite side of the harbour, four miles from Shelburne, Burchtown (now Birchtown) was laid out for about 400 Blacks. They had been brought to Shelburne as servants or slaves and given their freedom there. With their consent and approval, most were removed in 1792 to Sierre Leone, Africa, although some remained and their descendants still live in Birchtown.

For the first three years of Shelburne's existence, the British government gave rations to the inhabitants. Many of these people were educated and had been wealthy. They were not accustomed to the hard work of settlers. When rations were discontinued, people began to desert the town. Many returned to the United States and others moved to different parts of Nova Scotia. In the decade following, the population of Shelburne dwindled to 300.

Deputy Surveyor William Morris surveyed what was called Guysborough Township, 19,700 acres based on Broad River, for occupancy, with a townsite in the southwestern corner of the township. The legionnaires drew their lots by picking numbered slips of paper from a hat. The township was named in honour of Sir Guy Carleton, the humane commander of the forces at the evacuation of New York.

The harbour had been named Port Mouton as the result of a sheep falling from a French vessel in the seventeenth century and drowning, and the village at the townsite became known as Port Mouton. This was spelled "Matoon" in Simeon Perkins' diary and is still pronounced that way locally.

A week after their landing, 70 Blacks left H.M.S. *Sophie* to settle themselves, and, from then to the end of November, 700 of the British Commissary Department and some other soldiers were set ashore. About 2,500 people spent the winter of 1783-84 at Port Mouton with no housing. A little lumber was obtained from Liverpool, but most of these people were poorly sheltered in log huts, stone and sod huts and tents of ship canvas—and it was a cold stormy winter. Most of them subsisted on the commissariate daily ration of a pound of salt pork and a pound of hard biscuit, plus fish, clams, rabbits, waterfowl, moose and caribou. Sickness was common and many died that winter.

In mid-May, fire spread throughout the makeshift village and ran for miles through the forest under a strong southwest wind. This destroyed everything, and the people were driven to the water. In response to a hurried appeal to Halifax, a naval transport came promptly with supplies. Some 280 of these people were taken to what is now St. Stephen, New Brunswick, and 130 to Digby. Several hundred, mostly of the Commissary Department, were taken to Chebucto Bay where they established the new town of Guysborough.

Most of the legionnaires remained at Port Mouton. Survivors of the 70 Blacks later moved to Liverpool where they settled on the outskirts of the town with others who had come as servants and slaves of New Englanders settling at Liverpool in 1759-60.

Meanwhile, forest lands were being granted to settlers, with the large white pine trees generally being reserved to the Crown. Upon directions from Surveyor General (of Woods for British North America) Wentworth, Charles Morris explored the Shubenacadie lands in search of pines in 1784. He found pines of the Broad Arrow specifications to be scarce and marked only 22 of the largest (24 to 30 inches in diameter) with the Broad Arrow. Other pines there were small but free of knots, and Morris thought they would be valuable in a few years. Traversing the woods in other places he found that all the large pine had been cut. From lumbermen, he learned that there were no pines left "of sufficient dimensions for a Sloop of War."

About this time, John Nutting was exploring the woods of Chedabucto and Antigonish for pine for masts and spars. After searching the forests of the eastern mainland for over two months, he found only a few scattered pines that were suitable. There was pine, mixed with spruce, hemlock, elm, beech, birch, maple and oak, but nearly all of it was too small or too short. He marked none but warned the inhabitants not to cut any pine that might serve the navy requirements.

Until 1767 there were practically no roads in this province, and for years after that what were called roads were merely blazed trails through the woods with no bridges or other structures. Streams were crossed at fords or "wading places." In 1783 a "road"—really a horsepath—was cleared from Port Mouton to Liverpool. It was cleared the width of a man's outstretched arms, as was general in the colonies, and bridges of poles were built across rivers and brooks on it, an unusual practice in those days. Prior to that, the means of transportation had been mostly by ships and boats along the coast and navigable rivers, and by canoes on lakes and rivers, following the old Indian portages between the various bodies of water. In fact, for some years, these portages were the best roads except for Nicolas Denys's half-mile road at St. Peters, built about 1651.

In 1767 the first settlers arrived at Pictou and opened a road from Pictou to Truro. Poor drainage and swampy conditions caused this road location to be rerouted over Mount Thom. Until 1832 this route, called the Cobequid Road, was the regular line of communication between Truro and Pictou. Until 1810 carriages could not pass over the Cobequid Road because it was still rough and soft in many places and practically impassable in spring thaws.

Provision of land for road rights-of-way with land grants started in 1768. This was done by reserving land in townships and counties for that purpose, even though roads might not occur on the reserved areas. Annapolis Township appointed a road commission in 1770 but for the next generation most travel and transportation continued by water, and few settlers cared to move far from navigable water. By this time, logging or tote roads were better for winter travel than the public roads. In fact, many of these later became public roads, opening the country for settlement.

From 1780 to 1810 appropriations of money, large for that time, were made by the Nova Scotia government for the construction of roads and bridges. These were direct contributions from the taxpayers. As early as 1765 taxes had been levied by communities for projects such as roads, jails and courthouses. In Pictou County, from 1795 to 1802, the annual taxes were: poll tax—three shillings for men 16 and over; horses, one year and older, and cattle, four years and older—three pence per head; sheep, one year and older—a half penny; land—three pence per 100 acres, for repairing and building highways. Taxes were generally paid in grain, maple syrup or some other commodity. These taxes indicate that, at that time, 100 acres of virgin timber had the same value as a horse or an ox.

It was not until the Loyalists arrived in 1783 that road building really got under way, however. Most roads were still only trails cleared to arm's width, although some were being cleared wide enough for rough carts to be hauled over stumps and rocks in summer. Many places were impassable in spring thaws and fall rains, but good for sledding when there was sufficient freezing and snow.

In 1786 the Legislative Assembly voted that each township was to build and maintain its own bridges. Road construction accelerated throughout the province. Bridges were built across the Bear, Nictaux and Moose rivers and at Windsor before 1800, and connecting roads were extended from Bear River to Windsor, following the south side of Annapolis River. Roads, such as they were, and bridges were also built throughout most of the travelled parts of Nova Scotia. In 1807 a ferry served for crossing the lower Bear River; in 1865 it was replaced by a bridge. A road between Pictou and Musquodoboit was opened for travel by horses and oxen in 1792. Most of the roads were opened to connect the villages along the coast but some, such as between Halifax and Truro, Halifax and Windsor, Shelburne and Annapolis Royal, and Liverpool and Nictaux, crossed the province. It was common practice for the men of each village to open the road halfway from their village to the next.

Edwin Crowell, in his history of Barrington Township, stated that a road was opened from Halifax to Yarmouth in 1799 and that mail was carried between these points once a week. But "In 1825, the road from Shelburne to Clyde River was passable for horses but for no carriage of any description."[18]

As early as 1768, before any British settlers had located in what is now Antigonish County, a number of French families, some of whom may have been Acadians, settled at Havre Boucher, Tracadie and Pomquet. These people were treated fairly by the government and given grants of from 100 to 400 acres for each family.[19] The first British settlers in this county consisted of a party of disbanded soldiers who arrived at Antigonish Harbour with Col. Timothy Hierlihy in May, 1784. A grant signed by Governor Parr of Nova Scotia gave Colonel Hierlihy and 88 others 21,600 acres of land. Besides the grantees, there were 24 women, 62 children and some servants. They laid out a town at Town Point on the north side of the harbour and erected some homes. A little later, the Town of Antigonish was founded at the head of the harbour. Soldiers were generally not adapted to the life of settlers in forests. Most of them were careless and indolent and led a dissipated life as long as their provisions lasted. Then many sold their land and implements and left. In 1800, one good lot of 250 acres sold for as little as £2 11*s.*7d. Some left without even trying to sell their lands.[20]

The beginning of the American Revolution in 1775 had a profound effect on Nova Scotia. Many settlers were from New England where the Revolution started and had many relatives and friends there. Many who had come originally from New England tried to be friendly to both sides. In general, they succeeded fairly well, although they suffered severe privation. The people of Barrington and Yarmouth covertly traded with Massachusetts. The British did all they could to stop these friendly relations with the enemy. In 1775, all grown men in the townships in Nova Scotia were required to take the oath of allegiance to the British Crown and an act was passed for the enrollment of all male inhabitants aged 16 to 60 in the militia. But efforts to encourage or even to force Nova Scotia to join the Revolution came to naught. Later, New Englanders engaged in privateering and even actual piracy along the Nova Scotia coast, and Nova Scotians retaliated with successful privateering. "Shaving mill" privateers, as they were called, were unauthorized New Englanders with small vessels (some of which were merely open boats) who preyed on fishermen and other vessels along Nova Scotia's south shore.

The Broad Arrow Policy was one of the causes of the Revolution and defiantly, the revolutionaries of Maine put the "Pine Tree of Freedom" on their flags. The Broad Arrow Policy was also strongly resented in Nova Scotia but its effect here was not nearly as bad as in New England because most of our pine were too short. Pressing Nova Scotians into the British Navy also tended to embitter Nova Scotian settlers toward Britain. From 1775 to 1780 it was common practice for British warships to stop Nova Scotian vessels and press men into service. Many of these men never saw their homes again. Press gangs also went ashore for this purpose but in this they were less successful. At the first cry of a British warship entering the harbour most of the men suitable for naval service disappeared into the woods.

At the outbreak of the Revolution, John Wentworth, Governor of New Hampshire and Surveyor General of His Majesty's Woods in North America from 1766 to 1775, fled to New York. In 1783 he was reappointed Surveyor General of His Majesty's Woods and served as Governor of Nova Scotia from 1792 to 1808.[21] He was disliked by most woodsmen and landowners in the province because of the reservation of large pine trees for His Majesty's Navy; many settlers considered it absurd to clear land for farming and have to leave scattered large pine trees standing on the cultivated land.

CHAPTER 9

TYPICAL SETTLER'S LIFE

Then rose the log house by the waterside,
Its seams by moss and sea weed well supplied,
Its roof with bark o'erspread—its humble door
Hung on a twisted withe—the earth its floor,
With stones and hardened clay its chimney formed,
Its spacious hearth by hissing green wood warmed,
Round which, as night her deepening shadows throws,
The Hamlet's wearied inmates circling close.
The sturdy settler lays his axe aside,
Which all day long has quelled the forest's pride.
The wooden cleats that from the wall extend
Receive his gun, his oft tried faithful friend,
Which crowns his frugal board with plenteous meals,
And guards his rest when sleep his eyelids seals.

(Hon. Joseph Howe, *Acadia*)

It is hard today to imagine the difficulties that greeted the white settlers in the eighteenth century. They arrived by ship at places that appeared forbidding and offered only danger, hardship and deprivation. Few were prepared for life in the new land. Besides the Loyalists and disbanded soldiers, some settlers came because of persecution and prejudice in their homeland, some as a result of fabulous promises by their government, some in search of adventure.

Some brought building materials and furniture with them, but most arrived with only a few crude tools, cooking utensils, their clothing and food supplies to last only a short time. For the most part they depended on the forest to provide fur, clothing, logs, bark and moss to build shelters and wood for fuel. Collecting these materials and building shelters with the equipment at hand was gruelling work. Many had no horses or oxen and had to drag the logs, one at a time, by means of rope, with the front end of the log riding on a low, roughly built sledge.

Many early settlers had no glass. The few homes that had windows used animal skin parchment to admit dim light. There were no screens and from early May to early August the blackflies, mosquitoes and sandflies were constant pests in homes and outside. The settlers' only protection against these pests was smudge fires and smoke. Heat and most of the light in their homes was provided by a fire built in a huge fireplace that took wood in four-foot lengths. In cold and wet weather, cooking was done at these fireplaces on various arrangements of rods and hooks. In mild weather, cooking was usually done outdoors over open fires. Baking was done in Dutch ovens. The greatest redeeming feature was the bountiful wildlife. Even with the abundance of game, many inept settlers came close to starving at times, and scurvy was common.

Although Nicolas Denys had reported that there were no moose in Cape Breton circa 1655, moose were again plentiful on the island in the 1780s. Hunters were killing them for their skins, tallow and noses ("moose mosel," considered quite a delicacy). According to an article in Ronald Caplan's *Cape Breton's Magazine*, hunters from the United States illegally killed thousands of moose in the Cape North region in the winter of 1787-88.[22] Apparently the odour of rotting carcasses attracted the attention of passing ships and gave Meat Cove its name. Word of this reached Sydney and Cape Breton Governor MacArmick sent an expedition on snowshoes. At one place alone this expedition is said to have found the skinned bodies of 10,000 moose. In 1791 Governor MacArmick reported that between 6,000 and 8,000 moose were being killed each year in Cape Breton. He felt that, at this rate, moose would be exterminated; but he apparently believed that a kill of 4,000 yearly could be sustained.[22]

Chapter IV of the Acts of 1794 contained legislation for the preservation of partridge and blue-winged ducks (i.e., black ducks). It provided for a closed season for partridge from March 1 to September 5 and for duck from April 1 until August 5. The Act did not apply to hunting by Indians or by poor settlers taking fowl for their own use.

Predators were a problem in the last decade of the eighteenth century. Bears were numerous and carried off many sheep, pigs and cattle in Nova Scotia. Moose and bears also damaged wheat crops extensively in eastern Nova Scotia. Other animals also were killing the settlers' lifestock at that time, and this led to an act in 1801 entitled "An Act to encourage the killing of wolves, bears, loup cerviers and wildcats". This act initiated bounty payments that continued in the province until recent times. Steel traps were developed in 1797, and these leg-hold devices helped the settlers control predators.

Through necessity, settlers learned to tan animal skins for clothing. They wore buckskin jackets, breeches and leggings and, in winter, some fur clothing.

The most important item was the moose shank moccasin, copied from the Indian practice of wearing moose and caribou shank moccasins made from hides of the hind legs of the animals, generally with the hair-side in. Sometimes the skins were tanned, but not usually. The lower leg was skinned without splitting the hide, and the protruding section of the second joint above the hoof formed the heel of the moccasin. The portion of hide below this joint, closed by stitching with rawhide or sinews, formed the toe. In use the upper section was tied around the ankle, usually with a rawhide thong.

Before 1750 most settlers made many household utensils and furniture of wood, mostly yellow birch, hard maple and white pine. About this time, the English felling axe came into use in Nova Scotia. This was superior to the trade axe as it had a better shaped blade and handle, and the balance was better. But the handle was still straight and awkward, and there was no poll. Clearing forest land was an arduous task with the tools the settlers had, particularly where trees were large. It was generally customary to fell trees in whichever direction they happened to lean, to lop off the branches and cut the trees into lengths of about 12 feet, and then to pile the brush and logs and burn them. New Englanders brought with them the practice of girdling trees. A notch was chopped around the trunk, and the tree was left standing five or six years, by which time the small roots were nearly rotten, the branches decayed and the trunks partly rotten below the girdles so that they could be felled with little labour. The underwood was cut or "grubbed up" and piled in heaps; the trees were then felled parallel to each other. The logs were not cut but burned into proper lengths. In dry weather, small piles of dry branches were laid across the tree trunk. A notch was burned, and a single dry stick left burning in the notch and renewed from time to time, completed the job. After being burned into pieces, the logs were drawn together by oxen, piled with brush wood and burned.

The practice of girdling was fine for removing coniferous trees; girdled deciduous trees, however, produced suckers below the girdle, the roots continued to live, and removing the stumps of such trees required a lot of labour. Hardwood occupied most of the good soils and clearing such land continued to be a difficult task.

Although most of the settlers tried to be careful with fire, burning only at what they considered to be safe times, fires often got out of control and burnt extensive areas. Lightning also started forest fires that ran wild for miles. In the last 10 years of the 1700s, forest fires ran rampant over much of the province and were particularly bad in the southwestern part. Simeon Perkins's diary states that there were many fires in all quarters around Liverpool in June and July 1792, with nothing done to stop them.[23] Except for bogs and swamps, most of the land south of Rossignol and Jordan lakes from the Liverpool

(Mersey) River to the Roseway River was burned in 1800. Perkins noted that there was heavy smoke over Liverpool all that summer. In August 1800 a bad fire swept over much of Wilmot Township, Annapolis County, causing considerable damage to buildings and crops as well as to the forests.

Despite such natural disasters, settlers continued to carve their living from the land. The first seed planting for crops was usually in the areas where the trees had been killed by girdling or between the stumps after the trees had been removed. This generally produced good crops for several years, even where the mineral soil was not good, but the fertility of the humus alone did not last long. Many of the settlers soon noticed the improved fertility of land burned in early spring or when the mineral soil was moist. Wheat and potatoes did particularly well for several years; then came the task of stump removal, ploughing and fertilizing with manure and fish to grow any crops at all. On stony and rocky lands a great deal of work went into gathering stones and rocks and building rock walls or simply assembling the rocks in scattered piles.

Fortunate were the settlers who happened to be allotted the areas of good soils and even the limited-use soils. Elsewhere a great deal of labour and timber were wasted in clearing forests and trying to cultivate poor soils. The abandonment of farms because of poor or marginal soils in Nova Scotia has been a pitiful story. These abandoned lands were later taken over by white spruce, which today comprises about 10 per cent of Nova Scotia's forest area.

FOREST INDUSTRIES

Before the end of 1761, 15 sawmills were built or being built in the new townships along the south shore and through Annapolis Valley. These were waterpowered. In all of peninsular Nova Scotia there were 31 sawmills in 1767. Of these, four were at Lequille (near Annapolis), two at Chester, one at Cornwallis, one at Cumberland, one at Dublin (near LaHave), two at Horton, five at Milton (near Liverpool), six at Lunenburg, one at Newport, one at Onslow, one at Truro, and two at Windsor.

Dams on larger rivers were frequently "blowing out" or breaking down in times of ice and/or high water and a great deal of sawing time was lost. For this reason, many of the mills were located on smaller streams where the dams were much more dependable. In order to be close to lumber shipping points, most of the dams and mills were at the first falls or rapids above the estuaries. These mills were sawing for local consumption and for export to the West Indies, Bermuda, South America and Newfoundland, and some deals (sawn softwood timber of three inches or more in thickness and variable length) were shipped to England. With the waterpowered up-and-down single saw, production per mill averaged little more than 2,800 board feet per day, with most mills working about eight months each year.

As early as 1766 Simeon Perkins of Liverpool had orders from Norwich, England for boards and planking; that same year a cargo of oak timber and deals was shipped from Liverpool to London. The population of Liverpool Township was then 634, with five sawmills producing 335,000 board feet of lumber. Other production that year included 4,762 quintals of dry cod, 383 barrels of salmon and mackerel and 34 barrels of oil from whales and seals.[23] These products were shipped to the West Indies and traded for salt, rum, molasses, sugar and coffee. In 1770 six brigs and snows (small sailing vessels) carried timber from Liverpool to Whitehaven and Workington, England and in 1772, two cargoes of lumber left the same port for the West Indies. A cargo of lumber was shipped from Liverpool to Newfoundland in 1774; that year and in the years following, more lumber was shipped to the West Indies. In 1777-78, vessels carried boards and spars from Liverpool to Bermuda and Surinam. The exports from Liverpool to England included square timber. Pictou's first cargo of square timber was shipped to England in 1774. William Kennedy moved from Truro to Pictou in 1768 and a year later built the first sawmill in Pictou County at Mill Brook. It was waterpowered. Besides lumber and square timber, Pictou was exporting split pine shingles four feet long and oak and ash barrel staves before 1800. The export trade in the 1770s, although significant for Nova Scotia at this stage of development, was really relatively small in scale. Most of the food, livestock and lumber required by the West Indies was supplied by the Thirteen Colonies.

In 1770 the British government started buying "ton timber" and shipowners were paid a bounty of a pound per ton. The "ton" consisted of 50 cubic feet of unhewn or rough timber in-the-round or 40 of hewn timber. A woods road leading into the north side of Sawlor Lake, Halifax County is still known as "Ton Timber Road." The manufacture of ton timber at Mill Village, Queens County was vigorous from 1770 until 1828, when it gave way to lumbering. Oak and pine were still the only kinds of timber valued for marketing. In 1769 Simeon Perkins wrote in his diary of a cargo of spruce lumber being shipped from LaHave and stated that it was a "singular cargo."

After the Revolution, lumbering and shipbuilding expanded somewhat. While in 1767 there had been 31 sawmills in the province, by 1783 the number had jumped to 65 and by 1785 to 90. These mills, costing perhaps £100 to £200 each to erect, sawed for the fast-growing local population and the West Indies trade. Little of their production crossed the Atlantic. However, from 1766 onward, full cargos of squared oak and pine timber, 12 inches by 12 inches and over and 25 feet or more in length, were shipped to London from Liverpool. The first mill known to have been built on the St. Croix River in Hants County under British rule was erected at St. Croix for George H. Bulk in 1762. This was a grist mill; Bulk later obtained a grant of 1,500 acres and built a waterpowered sawmill in 1765. Brooklyn, Queens County had its first sawmill in 1785. The output of this mill in 1808 was 55,457 board feet and it continued operating until 1875.[23]

After the American Revolution, Nova Scotia continued shipping small quantities of lumber to the West Indies, but this trade for rum, molasses and salt from the West Indies was limited. The sudden population increase in Nova Scotia, resulting from the influx of Loyalists and disbanded soldiers, so affected the supply of provisions in the province that permission was granted to import some kinds of food from the United States. After the arrival of the Shelburne settlers in 1783, lumber was transported from the New Brunswick side of the Bay of Fundy for housing them, and in 1784 it was necessary to allow importation of lumber from the United States.

There were problems with the quality of lumber produced in Nova Scotia. In the eighteenth and nineteenth centuries, lumber was shipped from Nova Scotia not only without seasoning, but soaking wet. It was common practice to raft plank and other lumber from sawmills downriver to harbours, where it was winched from the water and stowed directly into vessel holds or piled on deck or both. At times there must have been some deterioration or even decay before the lumber reached its destination.

Shipbuilding in Nova Scotia began in earnest about 1764 with the arrival of ship carpenters from Massachusetts.[24] As soon as the Proprietors of Liverpool Township were settled in their new homes that year, they started building vessels to pursue fisheries. As early as 1765, some 17 schooners had been built. Shortly after this, construction of schooners and other small vessels started in a number of settlements along the coast; in 1767 Simeon Perkins built a brigantine at Liverpool. Between 1768 and 1770 two schooners were built at Annapolis Royal. Shipbuilding had a good start in Nova Scotia before the war, but this ended abruptly in 1775. Most shipbuilders and seamen then turned to privateering and to producing and shipping timber to England for the Royal Navy.

In the latter part of the eighteenth century, tanneries began to spring up across the province. This was a forest-related industry, as hemlock bark was an essential ingredient. The use of hemlock bark for tanning leather had started in New England about 1650, but did not reach Nova Scotia until New Englanders started moving into the province after the 1760s. This practice would reach its peak circa 1880 and continue well into the twentieth century. The bark-peeling season was from the full moon in May to the full moon in August, but May and June were best. Large hemlock trees were felled and the bark removed in four-foot sections. To prevent molding and excessive curling, the sheets were leaned against the fallen tree trunk to dry. Until about 1910 it was common practice in many places to leave the debarked hemlock logs to rot in the woods.

Yarding crews were comprised of a swamper, a teamster, and a jumper tender with a horse and jumper. Depending on the chance, they yarded from one-quarter to three-quarters of a cord of bark a day. The main haul was usually on snow roads in winter with 16-foot racks on double sleds. A pair of horses could haul about two cords of bark per trip. In old-growth hemlock, 2,000 board feet of standing timber yielded about one cord of bark. The price per cord of dry hemlock bark at tanneries averaged $6.75 in 1870, $5.51 in 1900, and $12.50 in 1917 in the eastern United States.

As early as 1775, tanneries used waterpower from Barrington River; Thomas West had a tannery at the mill stream near Barrington at that time. The first tannery in Liverpool was built in 1810. It was abandoned during the War of 1812 until 1821, then operated until at least 1872. A tannery started operating in Bridgewater in 1825.[25]

Pictou County had tanners from about 1810. In 1876, this county produced tanned leather valued at $346,974 of the $769,993 value of all tanned leather produced in Nova Scotia. Hemlock bark was used for tanning until it was replaced by chemicals. In 1871 the first steam tannery operated in Liverpool, and others followed.

The smelly tanning business had less popular appeal than shipbuilding and sawing lumber, but it was an important industry throughout most of the range of eastern hemlock forests. The industry eventually declined because the principal source of hides shifted to the West and chemically manufactured tanning agents became more efficient.

5

THE NINETEENTH CENTURY: 1801-1850

Nova Scotia's timber trade came into its own in the first half of the nineteenth century, when Britain began to depend increasingly on the region for squared timber as well as for ships. Wood products were also shipped in growing quantities to the West Indies. A new breed of lumberman appeared on the scene to meet the demands of a growing market. As coastal timber was exhausted, river drives brought logs to mills from farther inland. Development of railways had just begun but already promised to greatly increase demands for forest products and shipping.

EARLY SURVEYS

In May 1801, Nova Scotia Governor John Wentworth commissioned Titus Smith, Jr., with a Mr. Carter, to make a survey of the least frequented parts of the mainland of the province to locate areas suitable for growing hemp required by the British Navy. Smith was to also note soils, the species, size and quality of the timber, and the facility with which it could be removed to market. This was all to be done in 50 days at a rate of 11 shillings 8 pence per day for him and 8 shillings for Mr. Carter "during actual services, in full for pay and every contingency."[26]

Known as the Dutch Village Philosopher, Titus Smith, Jr. was proficient in several languages and devoted much time to mathematics, astronomy, geology and botany. He was one of North America's pioneer ecologists.

The survey actually took 134 days, including days lost due to rain and illness. During that time Smith and Carter travelled well over 1,000 miles on foot. They made one tour from Preston, near Halifax, to the Strait of Canso and back to Preston between May 5 and June 7, 1801; a second tour from the Head of St. Margaret's Bay to Clyde River and back to the Chester-Windsor Road between July 8 and August 18, 1801; a third tour from Falmouth, Hants County to Tusket, Yarmouth County and back to Halifax-Windsor Road between August 22 and October 19, 1801; and a northern tour, September 4 to October 16, 1802, from Partridge Island (Parrsboro) to Advocate, Nappan, Pictou and, finally, to Shubenacadie Grand Lake.

Travelling by hand compass, with a good map of the coast but not of the interior, Smith kept his traverse lines remarkably well-spaced, considering the numerous unmarked lakes that confronted him. From the courses, mileage, time of travel and topographic features described in his report, in the form of a diary, it was possible to reasonably plot the traverses on a map. From this information and Smith's descriptions of land and forest types, an estimate of the acreages of these types was compiled by the author and is shown, compared with recent and much more accurate estimates, in Chapter 4, "Provincial Forest Inventory."

According to this estimate, Smith found over a million acres of "burn," probably burnt from 1791 to 1800, and more than 1,300,000 acres of "barren," mostly older burn, some of which contained some seedlings and immature forest growth. Much of the barren was covered by whortle (huckleberry), blueberry and sheep laurel with some open stands of scrub hardwood. There was considerable open fire barren which had been burnt repeatedly before 1791.

In some places, particularly north of St. Margaret's Bay, there were miles of country where nearly all the trees had been blown down in the Great Storm of 1798. At times it took Smith and Carter a half hour to travel a hundred yards because of these fallen trees. The Great Storm, which occurred on September 25, 1798, had blown ships ashore and caused great damage in Halifax and along the south shore as far west as Liverpool. The forest destruction from this hurricane covered an area of over a million acres, stretching from Porters Lake, Halifax County on the east to Shelburne County on the west and north as far as Windsor. Simeon Perkins reported that foliage of trees, crops and other plants turned black. This was attributed by some people to "the salt water in the air."[23]

Smith and Carter found the tallest and best pine in the Medway and Pictou areas—18 inches to 3 feet at the butt—and many were suitable for masts. The larger trees were 125 to 175 feet tall. Elsewhere the pine was usually too short and/or crooked for masts, although many trees were suitable for spars 60 to 70 feet long. Smith stated that many hills near Shelburne would produce good pines but fires were so frequent there that trees did not have time to grow to any size.

At what is now South Brookfield, Smith met William Burke, the first northern Queens County settler, who had settled there in 1798. Noting an extensive area of even-aged, comparatively young beech, yellow birch, hard maple, ash and hornbeam, Smith asked Burke about it. Burke said Indians had told him that the forest there had been all blown down about 80 years before and had burnt in a large fire the following year. This hurricane and fire of about 1720 had ravaged an area approximately 30 miles long and 20 miles wide from just east of Lake Rossignol to east of Middle River, Lunenburg County; the area had later grown up chiefly in beech.

According to Smith's report in 1801, "Beech forms the greater part of the woods in our best land; what is called hardwood land being generally covered with beech, with small proportion of birch and maple."[26] In his list of tree species in mainland Nova Scotia he included hornbeam (or ironwood), which he mentioned frequently in most of his travels.

White-cedar was also included in his list although it is not mentioned in the diary of his tours. Common in the 1600s and apparently rare by 1801, most of the cedar must have been eliminated by disease or insects as there would certainly have been very little utilization before 1802 in the remote areas traversed by Smith and Carter.

Surprisingly, Smith's list of tree species on mainland Nova Scotia included sycamore (*Platanus occidentalis*) and lyme tree (*Tilia*). Nowhere else is there a known record of sycamore in Nova Scotia. The sycamore is now native to southern Maine and exists west and south of that area. As mentioned earlier, the lyme tree or basswood was here prehistorically, although no other record of it existing in the forests of Nova Scotia in historical times is known. The basswood is native to south New Brunswick and exists west and south of that area. Although this species is now a common shade tree in Nova Scotia, it started from trees imported from the United States.

Smith further stated in his report, "We observed near the large lake on the head of Liverpool River (Lake Rossignol), plants which grow in the Southern States and we have not in any other part of this Province."[26] These undoubtedly included the poison ivy and cat briar—species which still exist in that area.

He commented on the animal life of the province:

> The moose appear to be almost entirely destroyed in most parts of the Province, the few that remain are chiefly in that part which lies west of LaHave River. The caribou are more numerous than the moose but are very few compared to what they have been heretofore, owing to the fires which have burnt over the open barrens and destroyed the reindeer moss which is their principal food. They herd together and are numerous on the hills south of Digby and the Annapolis River and upon the mountains between West-Chester and Pictou in the summer season. In winter, they usually approach the southern sea coast if the snow should be deep.[26]

In the swamps within the area burnt in 1800 west of the Mersey River, Smith found many moose and bear tracks. Moose were actually scarce in most of Nova Scotia in 1800 and this scarcity continued until about 1825. Apparently there were no deer in Nova Scotia at that time and there is no mention of wolves in this report. The caribou had left that part of the country because there was very little caribou moss left after the fires. In 1830 caribou were most numerous in the southwestern part of the province, "usually in large herds."[27] The reindeer moss and the caribou must have made a considerable recovery by that time on the open barrens west of the Mersey River, which had been burnt in 1800.

In his report Smith stated,

> The beaver are almost all destroyed, although there is perhaps no country where they have been more numerous heretofore than in the barren parts of this Province, as appears from the remains of their old houses, canals, etc. which are to be found upon almost every one of the innumerable small lakes in the Rocky part of the Province. I have not seen more than

> half a dozen inhabited Beaver homes in the whole course of my tour. The consequence of this scarcity of game is that the internal parts of the Province are (now) but little frequented by the Indians in winter. In the Summer they take considerable quantities of Salmon, Gasperaux and Eels in the different Rivers which they frequented. I think a considerable number of them have left the Province, as I have been informed at many different settlements that there are not half so many Indians about them as there was some years ago.[26]

In his travels, Smith eventually reached what is now Tusket, Yarmouth County.

> The land is very rocky and poor near the salt water. There is a French village below here where the people live entirely upon Eels and Patatoes [sic]. One of the most able of them assured me that most of the French families did not use 4 Pounds of Flour in a year. They keep sheep enough to make their own Clothing, and the Meat and Butter which they sell supplies them with the little money they need. They tell me that they often catch 30 Barrels of Eels in a night in the brook they live upon.[26]

Joseph Bouchette, Surveyor General of British America in 1830, recorded some changes that had occurred in the forest of Cape Breton up to 1825. He described St. Paul Island as being rocky with some marsh and bog, with stunted fir and white birch. According to Bouchette's report, all the west coast of Cape Breton was good land and was at that time thickly settled by Scottish farmers for four or five miles inland, and Port Hood was already exporting considerable agricultural produce to Newfoundland. Margaree Valley, and the coast from there to Cheticamp was entirely settled by Acadian fishermen/farmers. Apparently, the west coast of Cape Breton was mostly settled after Holland's survey of 1765-1767 and before that of Bouchette in 1825. Bouchette also described the whole of the Bras d'Or shore as being settled by Scottish farmers, although it was still more forest than cleared land.

CHAPTER 12

A GROWING MARKET FOR TIMBER

THE MARKET

The positive impact of the forests on Nova Scotia's economy, aided by the situation in Europe, continued to grow in the first part of the nineteenth century. In a paper entitled "Lumbering in Nova Scotia," C. Bruce Fergusson commented on this forest industry in Nova Scotia at the turn of the century:

> Lumbering in Nova Scotia remained on a relatively small scale until the time of the Napoleonic Wars, starting 1793. Then, no longer able to depend upon the Baltic States for masts, squared timber and the various other essential products of the forest, Great Britain was compelled to turn to her colonies in America. She not only sought these articles in the American colonies, but encouraged this colonial timber trade by means of duties and preferences. In 1799, British imports of timber from the Baltic were about five times those from British North America. In 1807, however, both the French and the British declared blockades of one another and, by 1808, Napoleon's continental system had become so effective that wood exports from the Baltic were virtually cut off. The result was that imports of squared timber [from that source] into Great Britain fell from about 215,000 loads [129 million board feet] in 1806 to about 25,000 loads [15 million board feet] in 1808. This was as effective and as dangerous a blockade as the submarine blockade in World Wars I and II. Without wood, ships could not be maintained in condition to keep the sea, and without ships Great Britain would be helpless. Hence began the policy of discouraging the importation from the Baltic. British colonial wood was given highly preferential treatment in the Customs Act of 1809. The next year the duties were doubled and in ensuing years they were raised to high levels. But timber from the British North American colonies suitable for naval purposes was admitted into Great Britain duty free. The result was that an immense impetus was given to lumbering in the colonies and the colonial timber trade suddenly became a chief factor in the development of British North America.

If the continental blockade in Europe made the colonies the most accessible source of timber for the British market, the duties on Baltic timber offset the high cost of the long Atlantic haul, which was about three

> times the cost of transport from the Baltic, and enabled the colonial timber trade to continue after the Napoleonic Wars came to an end. The result was that this trade grew at a rapid rate in ensuing years, particularly in the Canadas and New Brunswick, but it developed at an extraordinary rate in Nova Scotia also.
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> One illustration of the expansion of lumber industry in Nova Scotia is seen in the exports of the fir timber to Great Britain. It rose from 565 loads in 1800 to 25,203 in 1812.[28]

Delivered at English ports, pine masts were worth about one pound per lineal foot.[29] At that rate, a single mast 115 feet long would cost more than $8,000 in present-day Canadian money. Masts were always as long in yards as they were in inches diameter at the butt.[29] Thus a 115-foot mast—approximately 38 yards—would be 38 inches at its base.

C. Bruce Fergusson commented further on the growth of the Nova Scotia timber trade.

> On the St. Lawrence Gulf Shore, more than 100 vessels annually loaded with timber for the British market in the years from 1805 to 1819. Yearly exports from Pictou alone were at an estimated value of nearly £100,000. On one autumn day in 1808, twenty-six square-rigged ships, barques and brigs sailed into the port of Pictou to load timber. There one lawyer heard in mingled and discordant tones the rather uncouth dialects of Yorkshire, Cumberland, Durham, Northumberland and some Scottish counties, the tales of previous voyages to Christiania, Christian Sands and other ports of Northern Europe. In those years, it seems, the shipments from the rivers of the Atlantic coast and the lakes and harbours of Cape Breton Island were considerably smaller than those from the Gulf Shore, and the loads that left the Fundy shore, generally going to New Brunswick for re-shipment, were smaller still. In Nova Scotia in 1831 there were 44 ports and places which were considerably concerned in this export of timber.
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> If the necessity of Great Britain in time of war gave a great impetus to the colonial timber trade, the needs of the West Indies also contributed to its expansion. The United States having been excluded from the West Indies trade by means of its own Embargo and Non-intercourse Acts in 1807 and later years, as well as by the outbreak of the War of 1812, the people of the British West Indies had to turn to their fellow colonists for supplies of needed wood. The increased export to those islands is clear from the fact that 49 ships of a total 5,845 tons carried Nova Scotia exports to them in 1804, whereas 181 ships, of 26,101 tons, were needed in 1814.[28]

In 1818, only 150,000 board feet of pine, 24,850 oak and ash hogshead staves and 8,500 hogshead hoops were exported from Lunenburg, but by 1826 this export had increased to 250,000 boards, 158,375 staves, 730,500 shingles, 3,986 pine planks, 14,554 birch planks, 1,348 pine timber, 809 birch timber, 18 oak timber, 20 hemlock timber, 7,334 deals and 64 spars in that year.[28] Fortunately for Lunenburg, this export was to the West Indies, for in 1825 Britain fell into a terrible financial crisis. This produced severe losses to all engaged in the timber and shipping trade with Britain, and bankruptcy for many. Most who shipped cargoes of timber to England were brought into debt for the freight. Timber lay in rivers and harbours, unsaleable at any price, and most of it rotted. Starting with the emancipation of slaves in the West Indies in 1834, the West Indian trade formed the most considerable portion of Nova Scotia's commerce, and lumber was the greatest part of the exportation. The puncheon staves shipped to the West Indies from Nova Scotia were not suitable for rum but were used as containers for molasses. (Spiritous liquors require what is called tight-cooperage and this can be produced only from white oak which, except for a few English white oaks planted mainly in Annapolis Valley and their progeny, is not found in this region.) Most of the white oak used to hold spirits from the West Indies had been shipped there from the United States and England.

During the expansion of colonial commerce following the Imperial Trade Acts of the 1820s, new opportunities were available to export timber to other countries. Foreign markets were opened and domestic markets were expanded through the need for more shipping. In 1837, for example, exports from Pictou included 3,628,773 feet of boards, planks and deals, 374 masts and spars, 65,218 staves, 3,208 tons of hardwood timber, and 7,904 tons of pine and spruce timber. Exports from Cape Breton included 385,959 feet of boards and lumber, 493,750 shingles, 408,444 staves and billets, and 8,200 pieces of timber and deal ends. This preceded the financial panic that occurred late in 1837 and was worldwide. Depression continued until 1842. Between 1842 and 1860, Britain's timber duties were further reduced and then altogether abolished. After 1842, each successive reduction in the timber duties seems to have been followed by a falling off in trade, a depression in price, and hardship among the lumbermen. Then trade would increase and high export totals would be reached. At the same time, it appears loss of preference was offset, to some extent, by the natural expansion of trade and population and the construction of railways in Great Britain in the 1840s, with improvements in methods of production as well as transport in British North America.

Lumbering in British North America prospered until 1846, when there was another depression. This continued in 1848, which was the worst year of the nineteenth century for these colonies. However, the first half of that century ended on a note of optimism in Nova Scotia. The political situation, with the colonies acquiring responsible government, was of great concern, and reduction of Britain's favourable tariffs on timber was worrisome. But development and anticipated expansion of railways throughout the industrial world meant greatly increased demands for forest products and shipping in the near future.

SAWMILLS

As the demand for lumber grew, sawmills began to thrive in Nova Scotia. The village of Sherbrooke near the mouth of St. Mary's River was, according to Joseph Howe, "a creation of the timber trade." The first sawmill in this area is thought to have been erected about 1809 by James Fisher who came from Truro in 1805. A sawmill and grist mill were established at Sherbrooke by David Archibald III, also from Truro. (Descendants of this Archibald family still operate a water turbine sawmill within about 20 miles of Sherbrooke.) By 1817 there were about 20 houses in this village, besides the two sawmills and the grist mill.[30]

In 1826, William T. Archibald and Henry Cumminger entered into a unique agreement which is still on file at the St. Mary's Registry of Deeds at Sherbrooke. They agreed to build a mill at Sherbrooke with two sets of machinery, to be powered by water provided by cutting a canal from Sherbrooke Lake to St. Mary's River, a distance of about 850 feet, with the required dams, embankments, etc., at their joint expense. There was provision in the agreement that, should there be insufficient water at any time for working both sets of machinery to advantage, one party was to have all the water for one day and the other party the succeeding day, continuing alternately during the period of water deficiency unless they could agree otherwise. Apparently these mills were in operation by 1829. Although they were housed in a single building and shared common water and log pond facilities, the two mills were entirely separate. An additional agreement in 1829 provided for a partition between the divisions of the mill building throughout the upper storey and "from the lower end of the mill to the lower end of the logways to keep their lumber separate when it (was) run out (from) the mill."[30]

By 1856 this double mill was owned by brothers David A. and Alex N. MacDonald. In 1877 the mill had circular edging and crosscut or trimmer saws and shingle and lath mills, but one only set of each. The brothers signed an agreement concerning the amount of time each could use this additional equipment in conjunction with the operation of his own up-and-down sawmill. The mill was abandoned before 1900 and allowed to fall into ruin.

Today Sherbrooke Village boasts a realistic reproduction of the typical waterpowered up-and-down sawmill that operated on most streams and rivers throughout Nova Scotia in the early 1800s, built on the site of the MacDonald Brothers' mill.[30]

By 1840 the single up-and-down saws were being replaced by the more efficient gang saws and by 1890 had mostly been phased out.

Patented in the United States in 1814, the rotary or circular saw came into use in some sawmills in Nova Scotia around 1835. At first these saws were small and used only for edging and cut-off, but the edging reduced sawing time for the main saw and increased production considerably at low cost. Circular saws were then nearly a half-inch thick and wasted a great deal of wood in sawdust. As steel quality improved so did saw blades, particularly in circular saws. They were made thinner and reached diameters of seven feet or more. But since they had to be filed several times a day, the saw diameters shrank rapidly. This was overcome by the invention of insertable teeth which could be replaced when worn out. With the perfecting of circular saws, production in some mills reached 2,000 or more board feet per day. (By 1960 some circular saws were producing from 10,000 to 25,000 feet per day with steam power.)

From the 1830s on, technical improvement was rapid in the manufacture of lumber, and improved machinery was installed in various parts of Nova Scotia. The gang saw, essentially a multi-bladed gate saw, had much thinner blades that were only two-thirds as long as the single-blade gate saw. A reduction of kerf from 7/16" to about 1/8" meant a corresponding reduction in waste, and production was increased from an approximate average of 1,500 board feet to about 5,000 board feet per day. In fact, lumber production now increased to the point where removal of the sawn lumber became the limiting factor. This led to various systems of live rolls (powered rollers), dead rolls (where lumber was pushed on the rollers by hand), edging saws and cut-off saws. Some early Nova Scotia mills used several water wheels and later several turbines of various sizes to power the different mill units.

Although steamships had come to Nova Scotia earlier, the first steam engine in Nova Scotia was used by the General Mining Association in 1827 to pump water from a coal mine at Stellarton. Surprisingly, it was apparently nearly another 20 years before steam was used to run a sawmill here. Even after that, many sawmills continued operating on waterpower. Because of low water in summer and cold weather in winter, these operations were generally limited to spring and fall.

In 1845, E. D. Davison built a steam sawmill on the banks of the Medway River near Mill Village.[31] Joseph Letson, one of the oldest residents of the Mill Village-Port Medway district in 1978, said that the "Old Kettle Road," down the east side of the Medway River from Mill Village, was so named because the steam mill, built there by Ben Johnson of Waliston, Massachusetts in 1850, put out so much smoke and vapour that it could be seen for miles. This mill operated until 1875, sawing about 20 million feet per year.

CHAPTER 13

SHIPBUILDING

Shipbuilding thrived during these years.

> At the same time as Great Britain looked to her colonies for timber she also took from them a considerable number of ships. Often cargo and ship were both sold in the British market. This increased shipbuilding in Nova Scotia also meant a certain expansion in the lumber industry. Shipbuilding had begun many years earlier. It had been foreshadowed at Louisbourg by Captain Morel of De Monts' expedition in 1604, when a coasting craft was built there. It had been encouraged at Halifax by bounties in 1751, the year when Colonel Gorham built and launched a brig there. It had assumed importance at Liverpool in the 1760s and at other ports in ensuing years. In 1806, it took on added significance when the sloop of war *Halifax*, built expressly for the Royal Navy, was launched at Halifax, and Nova Scotia made another contribution to a growing naval tradition. Throughout the Napoleonic Wars, indeed, there was a market for ships of all kinds in Britain, and Nova Scotia helped to supply it.[32]

During the 10 years preceding 1812, some 378 vessels were built and registered in Nova Scotia. During the years of war with the United States (1812-1815) when more than 600 vessels taken from the Americans were brought into Nova Scotian ports, shipbuilding decreased. Then between 1815 and 1824 nearly 600 vessels were built and registered in the province. After 1824, when the Huskisson Act permitted colonies to trade with foreign countries and their possessions, shipbuilding grew apace; 600 vessels, of twice as many tons as those built between 1815 and 1824, were built in the province in six years.

The first vessel built at New Glasgow was a topsail schooner, *Isabel*, constructed by Charles Sutherland and launched at Clue's Brook. According to James M. Cameron's *The Industrial History of the New Glasgow District*, this vessel was launched in 1821; Will R. Bird's *This is Nova Scotia* gives the year as 1826. Many vessels were built on the banks of East River after that.[33]

The financial crisis of 1825 almost ruined the shipbuilding business, although it soon began to revive. However, most of the new ships were being sold, with their cargoes, outside of Nova Scotia. For several years after 1826 comparatively few ships of appreciable size were owned here. Most of these vessels were intended for sale in England and were cheaply built of spruce, poor quality pine and white birch timbers which were subject to early decay. The ships built in the British American colonies were inferior to those being built in Britain and the United States and they were a disgrace. They were called "leather ships" and "sailors' coffins" and, carrying deckloads of lumber, they often proved to be the latter.

Nevertheless, in 1829 Lunenburg had more than 100 vessels engaged in foreign trade, coasting and fisheries and, starting about 1831, more ships were being built for Nova Scotia owners. These were good ships. Between 1831 and 1837, about 1,000 vessels totalling nearly 100,000 tons were built and registered at the province. Indeed, the tonnage built in Nova Scotia in the 1830s was about four times that of the decade preceding 1825.

Known as Halfway River until about 1840, Hantsport was for a while one of the most flourishing shipbuilding places in Nova Scotia and the fifth largest shipbuilding centre in the world. Starting in 1839, Sen. Euriah Churchill built a number of vessels there, the largest of which was the ship *Burmah* of 851 tons, built in 1853. Senator Churchill then organized the firm of E. Churchill and Sons, including his boys, John and George. This firm continued until 1903, building 10 ships, 13 schooners, 30 barks, 6 barkentines, 19 brigs and 10 steamers. J. B. North had another shipyard a mile farther down the Avon River where he built 54 vessels from 1852 to 1894. The largest was a ship of 1,868 tons.[24]

From 1835 to 1875 the West Indies trade formed the most considerable part of Nova Scotia's commerce, and shipbuilding and freighting comprised a major part of that trade. In 1836, 40 vessels were built at Pictou and at nearby outports and sold for use elsewhere. Some of these were apparently of the "leather ship" type, and by 1841 leading shipbuilders and others at Pictou were bankrupt. After that, good ships were built at Pictou for local owners and shipbuilding was highly profitable until the 1876 depression.

Before 1840, vessels were "built from a board." A lengthwise profile drawn to scale on a board and showing the middle frame was used as a guide to the work. Molds or models were also essential to the shipbuilder's art. With some alterations, the same mold would do for shaping a variety of timbers. Boring holes for wooden pins to fasten the parts together was done from inside out, with pod-auger, hence "pod-auger days." With this method it took twice the time to build a ship as it did with improved methods after 1900.[34]

To build the ship, the keel timber was hauled into the yard and there sided and molded. Stem and sternpost were fastened to the keel while it lay on its side, and all were raised together. This was a great occasion when all the workmen were treated to rum. Next, the floor beams were fastened to the keel. The heads were then ribbanded, the garboards were treenailed and the navel timbers filled in. After this, the planking was continued up to the navel timbers and the futtocks were placed, joining the floor timbers. And so, the work continued to completion. Drafted plans, which came into use about 1840, were looked on askance by older builders. Until the method was proved successful they could not believe that all the molds could be made and the work planned at a distance.[34]

In the early days of shipbuilding in Nova Scotia, the red oak was considered the most suitable of the native woods for ship timbers; then yellow birch was found to be just as good and to last longer under wet conditions. Pine and spruce were used for masts and spars, and larch or tamarack for knees. Knees were used as braces where parts of vessels met at angles, such as a deck and the side of a hull. They were cut from stumps with large roots, which were dug from the ground, split to provide the correct angle and cut to the required length. To build the largest vessels, the knees were sometimes formed from split intersections of branches and trunks of large oak or yellow birch.

With the large export of ship knees in the 1840s and 1850s, cedar and hackmatack (larch) became scarce in the province—although cedar could not have been plentiful before that.

According to Fergusson:

> After 1850 products were specialized in various areas: Queens County produced pine boards; Pictou, where by the late 1820s pine stands had virtually vanished, hewn timber; Halifax, staves; and Cumberland, deals. Deals made along the Bay of Fundy and Minas Basin, as well as those of Cumberland County, were sawed from smaller spruces; pines of Atlantic bays and rivers were principally made into boards and sent to the West Indies market; the bulk of the squared timber was collected in northeastern harbours and sent to Great Britain; a quantity of cord wood was shipped from Annapolis, Digby and Yarmouth to the United States; sawed lumber was sent to Newfoundland or the West Indies. By the mid-century, indeed, timber was being obtained at greater expense than formerly, and the lumber industry felt the impact of fluctuations in demand and prices. By 1860, Cumberland County was producing more than two-thirds of all the deals manufactured in the Province; Queens more than half the quantity of pine boards; Lunenburg the largest proportion of spruce and hemlock lumber; and Pictou, Colchester and Halifax the largest proportion of square timber.[28]

OTHER FOREST ENTERPRISES

The first paper mill in Nova Scotia was the Acadian Paper Mill, established by Anthony H. Holland in 1819 at the outlet of what is now Paper Mill Lake on Nine-Mile River. Holland had this mill built to provide paper for his Halifax newspaper, *The Acadian Recorder,* and for various pamphlets produced by his press. The paper was made from rags. The mill had one 62-inch cylinder machine with a capacity of 1 1/2 tons per day. After Holland died, Messrs. T. and L. Piers leased the mill in 1837 from his estate for five years. Besides paper they made twine and codline. The mill had a lower storey of stone and an upper storey with walls formed of wooden slat, similar to Venetian blinds. This provided air circulation to dry the finished paper. The Piers employed Alexander Vissock as superintendent of paper manufacture. This mill later fell to pieces and Vissock and John Wallis of Halifax built another farther down the river, making only wrapping paper from rags. This mill burned about 1876 and was never rebuilt.

A citizen of Upper Sackville in Halifax County, Charles Fenerty, invented a method of making paper from spruce wood pulp which he made public in 1844. He had become interested in the process of paper manufacture as a result of frequent visits to the Acadian Paper Mill, eight miles from his home. He made his pulp by submitting blocks of spruce to the chafing action of a grindstone with the addition of water, and pressed the pulp into small sheets of paper. According to Fenerty, his paper was "as firm in texture, as white and, to all appearance, as durable as the common wrapping paper made from hemp, cotton or the ordinary materials of manufacture." He said, in effect, that his paper would have been of even better quality if he had sufficient means of giving it the required pressure.[35] In 1844 he submitted a sample with a letter to Messrs. English and Blackader, proprietors of the *Acadian Recorder*. Lacking the foresight of their predecessor Anthony Holland, these men gave no encouragement to Fenerty. Although his pulp and paper were the first made from wood in America, his invention was not patented and received no further attention until too late to be of value.

About the same time as Fenerty was experimenting with wood pulp, Freidrich Gottleib Keller of Saxony, Germany was doing likewise. The commercial manufacture of paper from groundwood developed from Keller's invention in 1843. His work led to the industrial production of paper from wood in Germany and Switzerland in 1852.

In the nineteenth century, the making of charcoal had some importance in Nova Scotia, not because of its large production or high value but because of its utility. This was the fuel used on most vessels for heating and cooking—although coal and coke were being increasingly used on ships in the latter part of the century. Charcoal is charred wood produced from partial or incomplete combustion. Its chief advantage for fuel is its light weight and reduced bulk: about half the volume and one-fourth the air-dry weight of the original wood with practically the same fuel value.

In the early 1800s it was made by the open-pit method, a wasteful practice as the valuable volatile products, such as wood alcohol and acetate of lime, were lost. In the open-pit process four-foot bolts of hardwood, two to six inches in diameter, were piled endways, usually in tiers of three bolts in a conical pile of from 10 to 30 cords. The wood bolts were piled closely and covered with a layer of three to five inches of leaves, moss, branches, etc. Covering this was soil and turf to a depth of two to five inches with openings left at the base to provide draft. A vertical shaft through the center of the pile carried off the smoke. The duration of burning depended on the kind, size and dryness of the wood, the weather and other factors, but it usually required several days and an attendant at all times, day and night. Great care was needed to see that the pile did not burn too rapidly and that any outbreak of flame through the outer covering was quickly covered with earth. Otherwise, the whole pile of wood would be burnt and lost. The wood was charred to perfection when the smoke turned blue, then the fire was extinguished.[36] The densest or heaviest wood made the best charcoal: in Nova Scotia this meant beech, then oak and sugar maple, then yellow birch, then white ash, in that order. The same species provided the best fuelwood in the same order, with red maple and white or paper birch having by far the lowest fuel value of the native hardwoods. By 1900, most charcoal in North America was made in ovens and in closed retorts, utilizing the valuable by-products.

CHAPTER 15

LIFE IN THE LOGGING CAMPS

THE LURE

By the early 1800s, many of the settlers of lands where the soil was only marginal had learned that they were not going to earn a living for their families farming the land they had. Even then, while some settlers were still clearing marginal land elsewhere, farmland was being abandoned. As the men took to the lumber woods, many family farms shrank to small acreages adjacent to farmers' homes.

In addition, several natural disasters occurred that had a significant impact on crops and the forests. Eighteen fifteen was known as "the year of the the mice." Millions of large mice with short tails overran most of the province, cutting wheat, other farm crops, and tree seedlings off near the roots. Most crops were destroyed. Billions of fleas attacked the mice in the late summer, and to rid themselves of the fleas, the mice rushed into the nearest bodies of water where they drowned. Their bodies floated and many washed ashore. These were field voles, sometimes called meadow mice (*Microtus spp.*). By the following spring, most people were reduced almost to starvation. The government distributed imported provisions and seed, allowing the people to pay for them by working on the country roads.

The imported seed distributed to the farmers by the Nova Scotia government was mostly wasted, for 1816 was "the year without a summer." Throughout northern North America it was also known as "the year of frost" and "eighteen hundred and froze to death."

Most crops in Nova Scotia were a failure. The meager foliage which had started on deciduous trees in late May was lost in June and new foliage which started after that was killed by frost in July. August was the worst month. Although this province got off more lightly than most of the northeast, there was practically no forest growth that year and summer frosts continued for the next five years throughout Nova Scotia. Newly shorn sheep, though sheltered, perished in 1816 as did newly born wild animals. Thousands of birds which had migrated northward died.

A petition was presented to the House of Assembly by the inhabitants of the County of Sydney on March 5, 1817, praying relief "from the failure of the crops for the last two years." In response, the government distributed a compensation of £8,000 to the farmers of the province.

It happened that 1816 was one of a series of cold years; it was cold over the entire world from 1812 to 1817. The depression of summer temperatures in North America was the most remarkable on record. According to William Humphreys of the U.S. Weather Bureau, writing nearly a century later, the cold years resulted from volcanic dust in the earth's atmosphere. This dust partially shielded the earth from the sun's rays but also permitted heat to escape from the earth.

Between 1812 and 1816 there were in fact three major volcanic eruptions: Soufriere on St. Vincent Island in 1812, Mayon in the Philippines in 1814, and Tambora on the Island of Sumbawa in Indonesia in 1815. Tambora, a 13,000-foot volcano, was the worst. It has been estimated that the terrific eruption of this volcano blew up to 100 cubic miles of dust, ashes and cinders into the atmosphere, generating a globe-girdling veil of volcanic dust. (By comparison the May 15, 1980 eruption of Mount St. Helens in western North America spewed only 1.25 per cent of this amount.)

> Once blown into the atmosphere—more specifically the stratosphere—it may take years for the dust to settle out. The finest particles from Krakatoa's eruption in 1883, for example, took 2-1/2 to 3 years to reach the ground.
>
> During this period, the average temperature of the whole world may drop a degree or two, while local losses can be considerably greater.
>
> Volcanic dust is believed to have played a role and perhaps a major one in the great climatic changes in past ages. Even relatively small variations in the earth's annual mean temperature can cause wide-spread changes in (polar) icepacks, world sea levels, desert boundaries and in the geographic limits of plant and animal life.[37]

It was fortunate for the farmers that the lumber industry developed as it did. Lumbering became so lucrative in the nineteenth century that farmers—those who had better soils as well as those on marginal lands—tended to neglect their agriculture for woods work. From 1803 to about 1812, inch boards sold for 40 shillings, or about $8 per thousand board feet, at the sawmill. Unskilled labour got the equivalent of 50 cents a day and mill sawyers 60 cents—good pay at the time. At first most logging operations in Nova Scotia were small family enterprises. A father would take his several sons, some before they reached their teens, to the woods in the fall to stay until spring. When their logging was not too far away they got home for Christmas. From October to May the wives, daughters and younger boys looked after the cows and other chores at home. In some cases this practice continued into the 1940s, explaining the illiteracy of men in many farm and lumbering communities. Many fishermen also took up logging during the winter. In these small operations of the early 1800s, logs were generally sold to the local mills, but small waterpowered sawmills and shingle mills were being operated, part time, near the sea coast throughout the province.

An example of a family logging-sawmill operation was the family of James Davison, living at the intersection of the Dalhousie or Old Annapolis Road and Ingram River, at the outlet of Bates Lake, Halifax County in the early 1800s. The father kept his several sons at home, logging, operating a small farm on poor soil and running a waterpowered sawmill. The sawn lumber was hauled by ox teams 2 1/2 miles east on the Dalhousie Road to a rough road built by Davison, and thence south on the latter about five miles to the Head of St. Margaret's Bay, where it was loaded on schooners. This man left an estate of over $40,000, a tidy sum in the 1850s.

THE PROFESSIONAL LOGGER

Although most farmers in the winter left their farm chores to their families and worked in the woods as axemen and teamsters for much needed cash income, they were not experts. As logging operations became larger in the early 1800s, with 30 or more men to a camp and some entrepreneurs owning several logging camps with large sawmills, there developed the logger or lumberer, later known as lumberjack, who was truly professional. Such men were good, hard workers and often stayed at one camp a full logging season. The skill of the professional logger was marvellous. Until about 1890, such men went to the woods with no tools but their axes and augers and with no nails or screws except nails for fastening the bark roof to the pole rafters. With these simple but efficient implements in their hands, they built their camps and horsehovels, their sinks, doors, tables, benches and bunks. They squared both hardwood and softwood timbers with their broadaxes as evenly as good sawyers would later do in the sawmills.

Until 1900 Nova Scotia loggers used the single-bitted or American poll axe and the broadaxe. The poll axe had succeeded the straight-handled English felling axe around 1815 in New England and shortly afterwards in Nova Scotia. It was made in weights of from 3 to 5 pounds; a 3 1/2-pound axe was favoured by most woodsmen. When first developed, poll axes had straight handles like the trade axe. Although the poll or head improved balance, the straight handle was still awkward. Gradually the curved handle developed and soon became universal. Not until 1853 were machine-made handles available.

They were sold separately from the axes; no logger or lumberjack would have bought a factory-hung tool. Choppers used heavy poll axes for felling trees, and light ones for limbs a few inches from the trunk, but if they were required to "knot" the logs (lop the limbs flush), they used a different poll axe with a different bevel to its cutting edge.[18] The broadaxe had been developed in the Baltic centuries long before. Some broadaxes weighed more than 13 pounds; most weighed from 6 to 10 pounds. Broadaxes had cutting-edges or bits of 6 to 10 inches or more, compared to 3 1/2 to 5 inches in the poll axe.[18] Axe handles of Nova Scotia loggers were made of native white ash—not as heavy, hard or tough as the traditionally-used hickory, but tough enough and springy as well. Axemen always carried whetstones and kept their axes razor sharp. The grindstone was used not to sharpen the axe but to thin the part above the bit.

Oxen were the first draft animals in Nova Scotia. Although some horses were used as early as 1774 and increasingly during the nineteenth century, oxen provided most of the power in logging until around 1900. They were less expensive to feed than horses and could subsist and work on meadow hay and corn meal while horses required oats and farm-grown timothy. Oxen were also steadier and better on rough, rocky terrain and on soft, swampy ground. If an ox was injured in the woods, he was killed and served as beef—albeit tough—in the camp.

Many teamsters became very fond of their oxen and horses and took good care of them. This close bond between teamster and team produced high efficiency. When logging operations became larger than family affairs, teamsters were paid more than other woodsmen because they worked longer hours. They fed their teams before breakfast while the other men were still sleeping and spent time with them after the day's work, blanketing and feeding, clearing their hooves of ice and caring for injuries.

In the days of square timber, another important part of the logging operation was the squaring. The crew comprised a liner, a scorer and a hewer. The liner removed a strip of bark from two sides of the log and drew his line along each side by snapping or pressing a chalked or charcoaled line along the log. With the string removed, the scorer then scored the log, always standing on it, notching at regular intervals through the outer wood and very close to what would be the finished face of the squared timber without scoring too deeply. The hewer followed the scorer, hewing to the line and using a plummet to determine his true timber face. One outstanding broadaxe man (hewer) was Harry Foster, a Nova Scotian who worked for the Brown company in New Hampshire. It was said that he could hew with the line (the string) still in place on a 20-foot log without cutting the string and never be an eighth of an inch off-line.[38]

High standards were required. In 1814, the legislature of Nova Scotia passed an "Act to Regulate the Exportation of Ton Timber." This required that ton timber for export be straight-lined and well squared, square-butted at both ends, square-edged and free from all marks of scoring, rot, splits or worm holes. No spruce or pine timber was to be shorter than 16 feet, and no hardwood shorter than 10 feet. No square ton timber was considered merchantable unless it was squared at least 10 inches, and timber that did not exceed 16 feet in length was to be equally big at both ends.[17]

THE CAMPS

Most of the early camps were mere hovels built of logs, chinked with moss, with roofs of poles and bark. The usual single door to a camp was small with a high sill to reduce drafts; most camps had no windows. The men's beds were usually fir boughs spread on the earthen floor, with the head towards the wall. Some of the early camps had floors made of poles with the top surface dressed by an adze; without bunks, however, it was more comfortable to sleep on the ground. A fireplace was built of stones or rocks in the centre of the camp with a hole in the roof and a short log chimney, which created a draft to draw out some of the smoke. The chimney was smeared with mud or clay to prevent it from burning and to improve the draft. Often the fireplace, called the camboose or comboose, was comprised of four logs laid in a rectangle with the interior filled with sand or gravel. A swinging crane at one side served for hanging kettles. A cook's table and the eating table were at the side of the camp opposite the bed. Cooking was done over an indoor open fire.

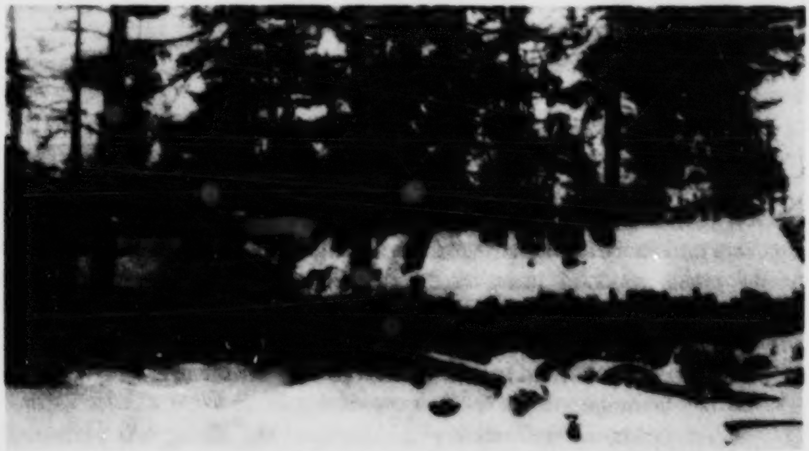
Cook stoves were first marketed in North America around 1830, but they were uncommon in Nova Scotia logging camps until 1840 or later. The advent of cook stoves in logging camps eased the cook's burden and improved the food of the woodsworkers considerably.

In the early camps there was generally plenty of food—mainly moose or caribou or both, salt beef, salt pork and salt codfish, sourdough biscuits, pancakes and molasses. Later, as large camps developed, prunes, raisins and dried apples were added. Beans were not common in logging camps until after 1850, but their use from then on made up for lost time. After 1850, baked beans were on the table for every meal, and there were usually doughnuts, two or three kinds of cookies, and apple or raisin pie. Tea, drunk in large quantities, was the only beverage.

In the cookhouse the cook's word was law. No talking was permitted during meals. At the dining table, each man had his regular position where he always ate. Space for newcomers and visitors was usually designated by the cook. Each place was set with a plate, mug, knife, fork and spoon. Food was placed on the long table in large containers and each man helped himself. As each one finished eating, he took his utensils to the cook's table, scraped anything left on his place into the slop pail, stacked his plate and put the other utensils into the large dishpans. He then left the cookhouse without a word to anyone.

When the men were working within a half mile of their camp, they went back for their noonday meal. When they were farther away, the cookee (assistant cook) carried the food and utensils to an eating place near the work. There he made an open fire, prepared a large kettle of tea and laid out the food, usually comprising bread, cold meat and cookies, with mugs or cups. In good weather the men lingered around the fire for awhile, swapping tall tales before returning to work; if it was cold they could keep warmer by working.

Camps were located near the logging area and were as easily accessible as possible by tote road from the settlements. Each camp was usually near a natural meadow where hay could be cut for winter feed for oxen. The privy or latrine and the stable, called a hovel, were always downstream from the well and constructed in the same manner as the camp. The hovel had stalls. The privy, built of smaller logs, had a pole floor and seat comprised of a pole about five inches in diameter, usually with the bark removed. Until the late 1800s, many of the privies had only three walls and a roof with the open side towards the northwest. This sheltered occupants from snow and rain to some extent, but with a cold northwest wind no one lingered longer than necessary. By the 1890s some logging camp privies had four walls and rough board doors.



Davison Lumber Company logging camp near Lapland, Lunenburg County (1903).

Collection of R. S. Johnson

CHAPTER 16

LOGGING AND DRIVING

Before 1810 most of the timber near the coast, of the species, quality and size utilized in those days, had been depleted and river driving logs to mills from farther inland had begun. Driving dams were built at the lake outlets to hold back the spring rush of water until it was needed to move the logs downstream. Such a dam had a plank gate in the middle. This was raised vertically in order to sluice logs through or merely to release water when logs were in the stream below. On the down-river side of the dam was a sloping apron built of logs or heavy plank so that logs landing endways would slide into the water below. On tributaries where no logs were being driven, splash dams were built to provide a head of water on the main stream when needed. A splash dam had a gate too, but only to let water through.

During the winter, logs were dumped from sleds on the ice in lakes or piled in brows along the rivers. As green hardwood does not float, drivers fastened hardwood logs to pine or spruce logs for rafting and driving. On the frozen lakes, they made up booms by fastening large logs end to end with chains and toggles, in a loop around the dumped logs. To hold the logs after the ice melted, they tied the boom ends to shore. The drive started as soon as the ice thawed, and the logs on the lakes were moved to the dams by means of headworks. With such contraptions booms of logs containing two million board feet or more, covering acres of water, have been moved.

A headworks was a square raft of pine or spruce logs, three logs deep, piled crossways, 12 to 20 logs wide (i.e., 18 to 30 feet). These logs were usually hewn square, but sometimes only the deck logs were hewn; occasionally not even these were hewn. They were strongly fastened together—in the early days treenailed with wooden pegs, later spiked together. In the centre of the headworks was a capstan: a spool made of a hollow log or a log hollowed for the purpose, which revolved around a wooden shaft. The capstan, which extended about five feet above the deck, had eight holes near its top for capstan bars.[38]

To warp a boom of logs across or down a lake an anchor of 200 pounds or more, attached to a 1,000-foot length of 1-1/2 inch rope, was used with the headworks. A rowboat with 12 men aboard carried the anchor the full length of the rope toward the driving dam and then returned to the headworks. Two men laboured at each capstan bar. It was racking work warping the boom of logs, which was tied close to the headworks, down to the anchor. When the headworks reached the anchor, 12 men got into the boat, raised the anchor and moved it ahead again while the four men on the headworks paid out the rope to keep it from tangling. Fair wind was a blessing; contrary winds delayed the process on lakes, sometimes for days at a time. This inefficient method of log transportation on lakes continued into the 1920s in Nova Scotia.

As Nova Scotia's rivers are comparatively small, river driving was not as hazardous as on larger rivers in some other parts of America; but it was hazardous enough. Many bones were broken and some lives were lost in clearing log jams.

The usual procedure in logging and driving was for the camp foreman to mark the haul road locations in late September and early October by blazing a line of trees from the timber felling site downslope to a lake or driveable stream. Where possible he carefully avoided grades of more than 5 per cent, as well as swamps and boulders. When steep slopes could not be avoided, hay or gravel was sometimes spread on the ice or snow road at hauling time to slow the descent of teams with loaded sleds. At times, chains called "bridles" were fastened around sled runners to serve as brakes. On extremely steep slopes, logs were sent skidding down dry chutes built of poles—usually only for short distances.

Once the route was located, the choppers (or loggers) and swampers cleared the smaller trees and underbrush from the road. The merchantable trees were always felled so that the butts were pointed in the direction that the logs would be skidded to log brows along the main haul roads. A brow is one or two tiers of logs laid parallel to the road on cross-poles laid at right angles in a spot convenient for loading sleds. Often with large pines they had to cut a number of small trees to use as beds so the large trees would not shatter when they fell. To allow for trim, logs were cut several inches longer than the length the finished lumber was to be, and the log ends were rounded so they would not be bashed in driving. Felling and swamping generally continued until Christmas, after which the hauling started.

In southwestern Nova Scotia, 8 to 10 weeks of snow and frozen ground suitable for hauling could be expected each winter until about 1890. Roads crossing swamps often had to be "broken down" by a team with an empty sled so that the bottom would freeze before heavy loads could be hauled. A lot of hauling time was lost due to winter thaws; men and teams had to be at the camps in any case waiting for hauling weather. In eastern and northern parts of the province, winter hauling weather was much more dependable.

On a long haul of a mile or more, where a large volume of timber was to be moved, special care was taken to locate and prepare the main haul road.

With several inches of snow on the ground, some light hauling was done to pack the snow and then the road was iced at night by a team hauling a sprinkler of water over it. There were several types of sprinklers, but the most common was a plank box about 14 feet long, 8 feet wide and 6 feet high, fastened atop a sled. This had a number of one-inch holes bored in the rear end with a vertical sliding door to close the holes. Water was loaded into the sprinkler by means of a barrel winched up one side of the box by a horse drawing a rope fastened to the barrel. The rope went over a block or pulley fastened to a frame on top of the sprinkler. Once in the box, the barrel was tipped by a long pole from over the rear end and the sprinkler was set in motion.

Setworks or headworks were used to pull a boom of logs across large, open lakes. A raft, built of logs from the drive, was attached by ropes to a boom of approximately 1,000 logs at a distance of 30 feet. A ship's anchor was positioned in the lake several hundred feet ahead of the raft. A capstan (as in the photo) or a hand winch was used to pull the convoy of raft and logs toward the anchor. Often the raft was forced downwards to the extent that the men would be up to their knees in water. The process was repeated until the lake was crossed.

Credit: Northeast Archives of Folklore and Oral History, University of Maine.

CHAPTER 17

FORESTRY AND WILDLIFE LEGISLATION

The first half of the nineteenth century witnessed the enactment of important forestry and wildlife legislation. For example, Chapter 12 of the Acts of 1840 established important legislation regarding Crown land. This act provided for a Lands Board—three or more persons in each county charged with collecting and transmitting Crown land information and receiving applications for grants. On payment of the purchase money, at the upset or minimum price of one shilling sterling per acre, an occupant was entitled to a grant not exceeding 200 acres. And Chapter 45 of the Acts of 1843 authorized the Governor in Council to settle prices of Crown lands and of ungranted lands where improvements had been made by the applicant. Authority was also provided for free grants to military personnel.

As previously stated, much of the surveying in those days was done carelessly and there are numerous overlapping grants. Military grants were mostly arranged systematically, with frontage on surveyed roads. Some of the other grants were laid out with some semblance to orderliness, but many were haphazardly arranged by metes and bounds surveys according to the wishes of grantees regarding the best woodland and/or good soil. Subsequent grants included mostly second-grade woodlands adjacent to the earlier grants, leaving to the Crown largely what was then unwanted land such as bogs, barren and burnt areas.

In 1848 legislation was enacted abolishing the offices of the Surveyor General and Commissioner of Crown Lands for Cape Breton and transferring their duties to the Surveyor General, Nova Scotia. This Surveyor General was John Spry Morris, and with this act "Commissioner of Crown Lands" was added to his title. Criticized by Joseph Howe for time-consuming surveys, Morris pointed out that there had never been a systematic survey of the province. Such a survey was not commenced until recent times.

Around the same period some legislative action was taken to conserve wildlife. In 1816 the Legislative Assembly passed a law protecting woodcock and snipe from March 1 to September 1 each year with a penalty of 10 shillings for each offense. Another act, passed in 1824 for the preservation of trout, provided a closed season from October 1 to January 1 with a penalty of one shilling for each offense. These acts did not apply to Indians or to poor settlers. Chapter 19 of the Acts of 1843 regulated the setting of snares for catching moose. The General Sessions were to make rules in this regard, including penalties for infractions, method of collecting, etc. In 1844, another act authorized the sessions to make rules regulating the taking of moose. Penalties were not to exceed £5 for illegal killing or £2 for selling moose meat.[17]

The killing of wolves was encouraged by an act in 1845. A bounty of 40 shillings was set for killing an adult wolf and 20 shillings for a whelp. The local justices were to issue certificates and payment was made from the office of the Provincial Secretary.[17] According to stories handed down by word of mouth, wolves were exterminated in Nova Scotia in the early 1800s, reappeared in the province following the Miramichi fire in New Brunswick in 1825, and shortly thereafter were again exterminated. Since wolves and caribou were present in New Brunswick and caribou were still plentiful in Nova Scotia, it is not surprising that wolves would appear in this province from time to time. In 1846 the bounty for killing a wolf was increased to £5, but the following year an act to continue the act to encourage the killing of bears, loup cerviers and wildcats made no mention of wolves.

6

THE NINETEENTH CENTURY: 1851-1900

Improved railway and canal connections were now making it easier to bring wood from the interior of the province to market. Shipbuilding and the manufacture of furniture flourished, and names such as Von Ellershausen, McMullen, Hart, Davison, Dickie, Benjamin, and Stehelin commanded respect in the lumbering industry. The century ended, however, in a series of political indiscretions concerning woodlands and transportation that would eventually mean the loss of millions of dollars to Nova Scotian taxpayers.

THE PROVINCE OPENS UP

The latter half of the nineteenth century witnessed the opening up of the province by rail and canal. These improvements had a direct impact on the forests, considerably easing transportation of forest products to market. Steamship service between Nova Scotia and New England, tied in with coach service in the province, linked Boston and Montreal to Halifax.

RAILWAYS

The first general railway service in Nova Scotia started in 1858. Construction began on the 45-mile long Halifax-Windsor line in 1848 and shortly afterward on the Halifax-Truro line; however, there was so much political bickering, plus financial and right-of-way difficulties, that 10 years slipped by before train service was available. The railway from Windsor to Annapolis Royal was completed in 1869, but it was January 1, 1872 before there was a through train from Halifax to Annapolis Royal.

The line from Truro was extended to New Glasgow in 1865, with a spur line to Pictou; and the main line reached Antigonish in 1879. The railway from Antigonish to Mulgrave on the Strait of Canso was completed in 1880. The line from Truro eastward was known as the Eastward Extension Railway, owned by the Halifax and Cape Breton Railway and Coal Company. Later it became the Nova Scotia Railway, and when it was purchased by the Dominion Government in 1884, part of the Intercolonial Railway. Today it is part of the Canadian National line. The Intercolonial Railway from the New Brunswick border to Truro was opened in 1872. The Cumberland Railway and Coal Company main line from Springhill to Parrsboro, 28 miles in length, was built in 1872 and 1873.

In response to pressure from residents of Yarmouth to connect with the Windsor and Annapolis Railway at Annapolis Royal, a Western Counties Railroad from Yarmouth was constructed. The first ties and rails were laid

September 2, 1874 at Lovitt's Wharf (now Sweeney's Wharf) in Yarmouth, and the first locomotive for this railway was brought to Yarmouth by ship from Portland, Maine. The section from Yarmouth to Digby was completed and the first train ran in 1879. Lack of funds, however, prevented construction of a bridge over Bear River; this was known as "the missing link." Passengers continued from Digby to Annapolis by paddle wheel steamers until the federal government provided funds for a bridge; the railway was finally completed in 1891. The name of the Western Counties Railroad was changed in 1893 to the Yarmouth & Annapolis Railway. Shortly after that, it merged with the Windsor and Annapolis Railway to become the Dominion Atlantic Railway. The first through train from Yarmouth to Halifax under Dominion Atlantic Railway management ran in 1894.

In 1873, the idea for the Nictaux and Atlantic Railway was proposed. It was to extend from Middleton, Annapolis County to Lunenburg with a branch line from Bridgewater to Liverpool. The company was supposed to have access to a free right-of-way and allotments of Crown lands amounting to 75,000 acres in Annapolis County, 75,000 in Lunenburg County and 25,000 acres in any other county into which extensions might be made. Work on this railway was started in 1877 by Walker, Clarke and Roberts. In 1886, the name was changed to Nova Scotia Central Railway. It was financed by the province and the Dominion with bond issues. Work on the railway was intermittent, however, and it was 1889 before the line was opened to traffic.[39]

A railway from Point Tupper, Richmond County to Sydney with a train ferry between Mulgrave and Point Tupper was completed in 1890. Until the early 1900s, the train ferry was a tugboat with a couple of crude barges. Railway surveys had been made on both sides of the Bras d'Or Lakes in 1885 for this line—that on the north side to cross the Grand Narrows by a bridge and go on to Sydney via North Sydney, and that on the south to proceed through St. Peters to Louisbourg and thence to Sydney. There was a great deal of squabbling between politicians and residents of Inverness and Victoria counties on one side and Richmond and Cape Breton counties on the other concerning the route. The Grand Narrows route was chosen as it served a larger area and a greater number of people with slightly less line mileage. In 1894 the Dominion Coal Company constructed a railway from Sydney to Louisbourg. A railway from Point Tupper up the west coast of Cape Breton to Inverness was built mainly for the transportation of coal from the Inverness mines, although it also carried a considerable volume of pit props and mine timbers.

In September 1896 construction of the Liverpool and Milton Railway along the west side of the Mersey River was started. The first carload of pulp (10 tons) from the Milton Pulp Company mill at Rapid Falls was delivered at the Milton Pulp Company's new pulp shed and wharf at Liverpool on January 13, 1897.

The steam locomotive on the Liverpool & Milton Railway, the "Mersey," was basically an 0-4-0 (i.e., four drive wheels between two smaller wheels on each side) with an extreme overall passenger cab which covered the boiler and machinery, leaving only a short straight smoke stack protruding through the roof. Later the passenger car superstructure was removed from the locomotive and passengers were carried by an old railway coach. The fare was five cents from Liverpool to Milton and five cents from Milton to the pulp mill at Rapid Falls—ten cents for approximately four miles. Passenger fares alone gave a profit for the first few years but the passenger service was dropped shortly after the railway was rebuilt in 1906.[40]

The railway was the idea of F. H. Hutchison who came from Massachusetts to build a telephone line between Liverpool and Milton. The first engineer was Edward S. Braine, who served in that capacity until 1908 when he became an engineer on the Springfield Railway of Davison Lumber Company. He had come from England on the S.S. *Assyrian* which also brought the locomotive.

A railway along the south shore of Nova Scotia reached Barrington Passage from Yarmouth in 1896, and by 1900 trains were running from Halifax to Yarmouth. The firm of Cavicci and Pagano built most of the line, first known as the Halifax and Southwestern Railway—although it was sometimes called the Halifax and Slow Western. It is now a part of the Canadian National Railway system. One train ran daily, except Sundays, each way between Halifax and Yarmouth. The line carried passengers and freight until about 1960.

A political project to open Guysborough County to industry and prosperity which never reached fruition involved a proposed Guysborough Railway. Two lines were suggested: one from Halifax via the Musquodoboit Valley to Country Harbour Cross Roads and the other from New Glasgow via Sunnybrae. From Country Harbour Cross Roads to Guysborough the same route was envisioned in both proposals.[41]

Numerous meetings were held to discuss this proposed railway. The Halifax proponents favoured the Musquodoboit route, while most of the Guysborough proponents favoured that of Sunnybrae. Antigonish County residents felt slighted by both proposals and wanted their share of the proposed railway. The result of all the bickering and politics was the completion of a branch line from Dartmouth to Upper Musquodoboit, Halifax County, about 80 miles from Guysborough Town, and of another line 22 miles beyond Sunnybrae towards Guysborough, though nearly 50 miles short of that destination.

In 1883 for the first time the Department of Crown Lands was given some little authority to protect the woods against fire. The waste of the forests in the early days of railway construction was as appalling as it had been in the early days of settlement. During the first eight years that the Transcontinental Railway operated, for example, 20 times as much wood was destroyed by fire as was hauled out by railway. Chapter 23 of the Acts of 1883 stated when fires could be set and for what purpose. Section 4 covered precautions to be taken with matches, ashes of pipes, cigars and discharge of firearms, while Section 5 provided double damages for starting a fire on land owned by the offender or for not preventing fire spreading from land that was owned. Section 9 covered precautions required when locomotives passed through wooded areas and Section 10 covered the duty of the engine driver.[17]

CANALS

After Cape Breton became a permanent part of Nova Scotia in 1820, construction of a canal to allow ships to pass from St. Peters Bay on the Atlantic Ocean to the Bras d'Or Lakes was proposed. After five surveys and 15 years of off-and-on-again construction, the canal was finally opened to shipping in August 1869. Before freeze-up that year it accommodated 159 vessels with a total of 6,071 tons, besides 45 schooners and a number of small boats. In the years to come it was to prove its worth. For some years before World War I, an average of 2,500 ships passed through this canal annually, and from 1934 to 1969 Mersey Paper Company shipped over 200,000 cords of pulpwood through the canal. With a total length of 2,400 feet it was a shorter and much safer route to the Bras d'Or Lakes than was the natural Great Bras d'Or entrance north of the lakes. Today the waterway is used mostly by pleasure craft, but there is still some commercial shipping.

On the mainland, a canal linking Dartmouth and the Shubenacadie River opened for business in 1861. The chain of lakes between Dartmouth and the Shubenacadie River had long been used by the Indians as a canoe route across the peninsula between the Atlantic and Fundy shores. In 1778 a survey had been made, at public expense, with a view to building a canal between Dartmouth and the Shubenacadie River by this route. At a four-foot depth, it was originally estimated to cost £25,000. The matter was dropped until 1824 when the governor of the province proposed that a barge canal be constructed. After a survey in 1825 it was reported that a canal with a minimum depth of eight feet could be built for £53,344.

The provincial government granted £15,000 and shares were sold. Construction was started in 1826 and considerable work was done at the time but the canal was left unfinished. Following financial difficulties, the province of Nova Scotia assumed title to the project in 1851 and sold it to the Inland Navigation Company in 1854. In 1856 it was decided to reconstruct the waterway to a minimum four-foot depth instead of eight feet. This eliminated the need for the more expensive locks. Inclined planes were proposed on which boats and barges could be pulled by hydraulic power from Halifax Harbour to the first Dartmouth lake. The idea worked and the canal system actually opened. But costs were again higher than anticipated.

The diminished depth of the canal, plus the establishment of railways, made the system uneconomical. Railway service between Halifax and Windsor and between Halifax and Truro by 1860 reduced the canal's advantages. It operated until 1870 but the maximum annual tolls never exceeded $3,000. Evidence of the canal work, such as stone walls and broken-down locks, can still be found in places. Had the canal been completed by 1825, as was the famous Erie Canal between Lake Erie and the Hudson River, it might have been a profitable enterprise until 1860.

STEAMSHIP SERVICE

The first regular steamship service between Boston and Yarmouth was started by a Boston firm in 1865 but was discontinued that same year. In September 1866 a Yarmouth firm, headed by Capt. N. K. Clements, had the S.S. *Linda* making weekly trips on this run, and in June 1867 the *Linda* extended the route to include Saint John. Portland became the New England port of call in 1871, with rail connections to Boston and Montreal. The *Linda* also made connections with the S.S. *M. A. Starr*, which served regularly between Yarmouth and Halifax. There were also connections between these ships and the Davidson coaches which serviced the south shore between Halifax and Yarmouth.

The *Linda* was wrecked near Yarmouth in August 1871. Another steamer started the route in May 1872 but it too was wrecked in less than a month. By April 1873 the *Linda* had been raised and repaired and was back on the original route between Boston and Yarmouth. Sometime before 1879 the *Linda's* name was changed to S.S. *Dominion*. Later the S.S. *Evangeline* took her place.

CHAPTER 19

SHIPBUILDING FLOURISHES

Shipbuilding became more active in the 1850s. The province had by this time become famous worldwide for its wooden sailing vessels and their builders. Nova Scotia and Newfoundland were major sea powers. With a total population of less than 500,000, these provinces together had over 6,000 ships.

Although clipper ships were developed in the United States, the greatest designer of these fast vessels was Donald McKay of Jordan Falls, Shelburne County, Nova Scotia. His *Flying Cloud* and *Sovereign of the Seas* gained great fame and his fastest clipper, *Lightning*, sailed 436 miles in 24 hours in 1854—a speed not equalled by another sailing vessel—or by a steamship—until 1889. Donald McKay built 128 ships in New York and Boston.

Starting around 1850, some 70 vessels were built at Sherose Island, Shelburne County, 57 of them were built by Warren Doane. Only schooners and smaller vessels had been built at Barrington and Port Clyde before 1854; that year, however, a bark of 424 tons was launched at Port Clyde. Between then and 1880, 2 full-rigged ships, 7 barks, 2 barkentines, 2 brigantines and 11 schooners were constructed. They were built in the yards of Captains Thomas Coffin and J. D. Coffin, and James Sutherland & Sons. The largest of these was the *Hectanooga*, weighing 1,100 tons. Many vessels were also built at Shag Harbour, Shelburne County. In 1855 the abstract of vessels owned in Liverpool showed 1 ship, 13 barks, 10 brigs, 22 brigantines and 38 schooners—84 vessels in all, totalling 10,826 tons. By 1873 this figure had increased to 123 vessels amounting to 16,000 tons, most of them built in Queens County. Lunenburg was a leading builder of vessels of all sizes. Twenty-two vessels comprising 3,138 tons were launched there in 1860 and, before 1895, 13,000 boats (whalers, dories, skiffs, flat-keel and centre-board boats) were built in that town. In the 1860s a Campbell firm launched several large square-rigged vessels at Port Mouton, Queens County.

At one time there were seven shipyards at River John, Pictou County. "Around the time of Confederation, Nova Scotia built more ships than any country in the world," said Charles MacLennan of River John in 1977, "and River John, a community of 1,500 people, played a major role in this

Industry."[42] The two largest shipyards at River John were the Kitchen and the MacKenzie-MacLennan yards. These two yards launched approximately 150 square-riggers and schooners.

Forty-four ships were built on the shores of East River at New Glasgow in 1852. In 1854 the largest vessel constructed in Nova Scotia before 1874, Capt. George MacKenzie's *Magna Carta* of 1,465 tons, was built there. She was lost at sea with all hands three years later.

By 1864 Yarmouth was known as the richest shipping port in North America. Fifteen years later 297 vessels were owned by Yarmouth citizens—vessels built in Yarmouth County. Between 1869 and 1880, a number of ships averaging about 1,300 tons each were constructed at Weymouth and Digby. Meteghan, Digby County also had its shipyards. Nine vessels were built by William Burrill & Company at Little River between 1869 and 1880. In one year around 1870, over 3,000 vessels were built in Nova Scotia according to Hector MacLeod of Liverpool.[24] In those halcyon days, wooden shipbuilding here gave Nova Scotia the third largest merchant marine in the world, after England and France.

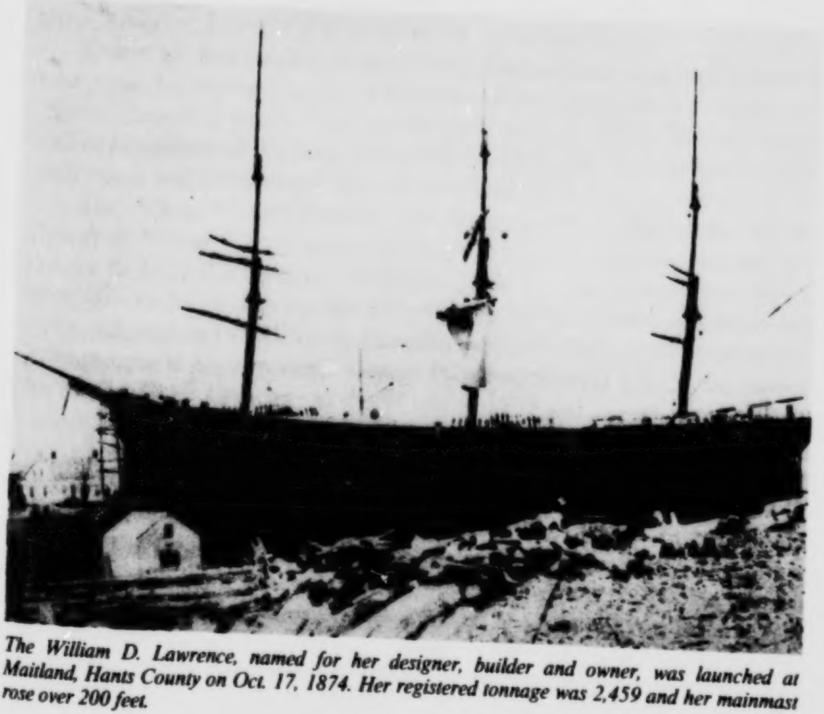
At the start of the financial depression in 1876, a total of 93 craft comprising 30,732 tons were registered at Pictou: 8 ships, 24 barks, 4 barkentines, 1 brig, 19 brigantines, 31 schooners and 6 steamers.

A cairn in front of the Lawrence House at Maitland, Hants County, marks the spot where the keel was laid for the largest square-rigger ever built in Canada. This was the *W. D. Lawrence* of 3,800 tons, named after its builder. Built in 18 months and employing 72 men, this huge vessel was launched in 1884. She was 272 feet long and carried a crew of about 35 men. The mainmast was over 200 feet tall from keelson to truck.

All this shipbuilding put a heavy strain on the province's forest resources. In his *History of the Maine Woods*, Philip I. Coolidge estimated a vessel of about 300 tons to require about 150,000 board feet of hull timbers and lumber for deck, superstructure, masts, spars and for cradle and staging.[43] A six-masted schooner of 3,424 tons built in Maine in 1980 required 1,225,000 board feet of pine and spruce plus 350,000 board feet of hardwood. Besides the timber and lumber used in the building of boats and vessels, considerable fuelwood was used in steaming and bending hull timbers—even though oaks and yellow birch growing with curves suitable for timbers and ribs were used at every opportunity.

Nearly every harbour in Nova Scotia, whether large or small, had its shipbuilding and/or boat industry in the nineteenth century. Even Port L'Hebert, Shelburne County, noted for its mud flats covered with eel grass and its winter populations of ducks and geese, had a steampowered sawmill and shipyard at Granite Village at the head of this shallow harbour. Several schooners were launched there before 1893. A forest fire destroyed everything in 1903, leaving nothing at Granite Village except huge granite boulders.

Many more vessels and boats than those noted here were built in the province. At the time of Confederation in 1867, Nova Scotia was the most prosperous province in Canada, due mainly to its shipbuilding, lumbering and fisheries. This prosperity waned badly with the depression of 1876 and some shipbuilders and lumbermen failed. After 1876 construction of wooden vessels in Nova Scotia improved for a short while; after 1880, however, such construction began to decrease sharply. The development of the screw propeller in 1850 and the advent of iron steamships gradually eliminated sailing vessels from maritime commerce.



The William D. Lawrence, named for her designer, builder and owner, was launched at Maitland, Hants County on Oct. 17, 1874. Her registered tonnage was 2,459 and her mainmast rose over 200 feet.

Courtesy of Maritime Museum of the Atlantic

CHAPTER 20

FURNITURE MAKERS

Excellent furniture of white pine, yellow birch and sugar maple has been made in Nova Scotia since the beginning of the nineteenth century by many artisans. Some worked individually or with a few helpers; many worked only part time. A few, however, established firms of considerable importance.

One of the first furniture firms was the Acadia Chair Company located at Portapique, Colchester County. It developed from operations by William and Charles Campbell before Charles Campbell died in 1851. William Fulton became a partner of William Campbell in 1860 and they produced good quality cane seat chairs under the name of Campbell & Fulton.

The Acadia Chair Company was incorporated in 1870 with William Campbell, George Fulton and others as shareholders and excluding William Fulton. In 1871 this company employed 15 men, eight women over 16 and seven girls under 16. It is not known when the Acadia Chair Company closed down, although in 1874 William Campbell was still operating the chair factory at Portapique in his own name. George Fulton apparently bought the assets of the Acadia Chair Company at sheriff sale in 1874 and moved the machinery to Bass River.[44] He took Almon Fulton, James H. Fulton and Suther B. Fulton into partnership. This new company became known as the Bass River Furniture & Building Company.[44]

In 1876 a company by another name, the Union Furniture and Merchandise Company of Bass River, was incorporated with George Fulton, Robert MacLeod and James H. McElhenny as the original shareholders. It sold furniture to several companies in Nova Scotia, as well as to two firms in New Brunswick and three in Prince Edward Island. Twenty-one people were employed in February 1886, 23 in March 1890, and 63 in May and June 1901. Women did chair seating on a piecework basis and were not included as employees.

The name of the company was eventually changed to Dominion Chair Company Limited (in 1903) and it still operates under that name. This firm and its predecessors had many ups and downs. The factory was destroyed by fire in 1885, rebuilt, and then partly burned again in 1892. Its bad luck continued into the twentieth century. It was completely destroyed by fire again in 1909, and in July 1948 the woodworking plant was burnt with a loss of $200,000.

William Fulton, one of the original partners of the chair factory at Portapique in 1869, had operated a sawmill at Bass River in the 1860s with his brother George. He moved to Truro in 1870 to become a partner with W. E. McRobert in the Truro Furniture Manufacturing Company, incorporated in 1873. He managed the factory of that company until his death in 1883; McRobert died in 1886. Unlike the Union Furniture and Merchandising Company, whose furniture was not upholstered, the Truro Manufacturing Company made mostly upholstered pieces. In 1883 The Truro company employed 11 workmen and had efficient furniture machinery for that period. This company and the Union Company co-operated in wholesaling their products.

Another furniture shop was established at Wittenburg, Colchester County. Michael Sibley had started working in his father's furniture shop in 1853 when he was 20 years old. By 1858 he was manager of a company making such items as chairs, desks, spinning wheels, tables, bedsteads, washstands, dressers, chests and coffins. According to George MacLaren in *Antique Furniture by Nova Scotia Craftsmen*, Ezekial T. Sibley and seven brothers bought Michael's shop and business in 1878. Their furniture was sold throughout Nova Scotia, New Brunswick and Quebec from 1883 to 1887. The business closed down in 1898.[44]

About 1879, a firm known as MacArthey and Company began making furniture in Pictou. Three individuals—Dewar, Archibald and J. Cummings—made furniture in New Glasgow at that time. Cummings employed 40 or more men and some women, making mostly chairs. The chair seats were pine, and pine boards 27 inches wide were not uncommon. Although some of the furniture was sold in Pictou County, most was shipped by vessel to Halifax and other Nova Scotian ports. The firm closed around the end of the century.

In the 1890s, a furniture factory also operated at Mill Village, Queens County under the direction of a Mr. Steadman.

LUMBERING

NEW DEVELOPMENTS

The Reciprocity Treaty between the United States and the British American colonies was signed in 1854 and was in force until 1866. This provided for commerce between the States and the colonies, further relieving the colonies of their dependence on Britain for trade. Nova Scotia's maritime location gave her merchants a great advantage in shipping lumber to the east coast of the United States. Thousands of cords of fuelwood were exported from Nova Scotia to New England in exchange for wheat, flour and cornmeal. The American Civil War of 1861 to 1865 brought further prosperity to Nova Scotia. The province gladly traded with both the North and the South and the export of lumber comprised a considerable part of that trade. The Franco-Prussian War of 1870-71 also improved the prosperity of Nova Scotia lumbermen. In the early 1860s square timber production dropped off in Nova Scotia— although not in New Brunswick or Quebec. This was partly because most of the accessible suitable timber had been cut in the province and partly because there was more profit in sawn lumber.

According to Desbrisay's history of Lunenburg County, a fifth of all the spruce and hemlock boards sawn in Nova Scotia in 1860 was manufactured in Lunenburg County. In that year the county produced 539,000 superficial feet of deals, 5,256 feet of pine boards, 7,745,000 feet of spruce and hemlock boards, 1,182,000 staves, and 99 tons of square timber. At that time Lunenburg County had 168 sawmills.[27]

By 1861, according to J. Lynton Martin, there were 1,401 sawmills in Nova Scotia, 15 of them powered by steam.[45] Mill workers in Yarmouth County were paid an average of *2s.2d.* per day, apparently less than wages paid in New Brunswick and Quebec. Sawn lumber sold for £2.6 per thousand board feet at the mill also less than in the other provinces. At that time, a sovereign or pound sterling was worth $5.00 Canadian and a shilling was worth 25 cents, as adopted by the banks.

Liverpool's first sawmill was the Eureka, a steam and watermill operation installed by James E. Barss & Brothers in the town on Mill Creek in 1865. It had a gang of 20 saws, a single saw for dimension stock, a lath machine, a circular saw and a planer. The gang saw was driven entirely by steam and the other equipment by waterpower or steam. The gang saw capacity was 25,000-30,000 board feet of lumber per 24-hour day. By 1872 Queens County had 20 sawmills, 18 single-set waterpowered gang mills, a steam gang mill and one waterpower rotary mill. Some were also equipped for manufacturing laths, clapboards, shingles, boxshooks and/or staves.

Until about 1860, when the iron turbine wheel was introduced, mill waterwheels were all made of wood, mostly well designed and carefully built. With the overshot waterwheels, the power was proportional to the size of the wheel. Some wheels were more than 25 feet in diameter but most of them had diameters of 12 to 15 feet. The undershot wheel was less powerful but more compact. Because they turned partly under water, however, these wheels were often damaged or destroyed by freezing, causing delays in sawing and costly repairs. Sawing time was limited to periods when there was no freezing and when the stream carried enough water to turn the waterwheel. This usually meant early April to early July and from September to November. Although some waterwheels continued operating long after 1870, most progressive operators changed to iron water turbines or steam about that time. The principle of the turbine had been known from ancient times but this was the first period in which it was put to practical use. (The turbine, located well below the water surface, is not affected by ice and is more efficient than the waterwheel.)

Until the 1880s most sawmills were built to remain in their places of origin, generally at rivers and other drivable streams. With the advent of steam equipment light enough to be moved on sleds and wagons, portable mills became the vogue. Many stationary mills continued operating, mostly sawing stream-driven logs, but portable mills were set up in areas remote from drivable waters. The lumber was hauled from the woods, leaving the sawmill waste behind to rot. Since more than 50 per cent of the volume and weight of the wood in the logs was waste and an additional 10 per cent consisted of bark, this was economical. But portable mills started many forest fires.

The first portable steam sawmill west of the Sissiboo River was that of G. D. Campbell of Weymouth in 1887. Steam brought greater efficiency, not only speeding the sawing but simplifying the moving of logs, lumber and waste material in the mills. "Live" rolls—cylinders revolved by mechanical power for moving sawn lumber in the mill—soon followed the introduction of steam, along with many other ingenious devices.

One of the best of these devices was the steam piston for moving the log carriage back and forth at high speed. With water power a cable had been used for this purpose and it was very slow. In fact, prior to the steam piston system sawyers rode the carriages on seats in most mills. With the rapid jerking back and forth of steam pistons, sawyers couldn't survive more than a few years, and before long took up stationary positions beside the saws and log carriages.

In waterpowered mills, logs and cants (logs slabbed on one or more sides) were turned on the carriages between cuts by men with cant hooks or peaveys. The cant hook or cant dog, used for turning, lifting and prying logs or cants, probably developed in Europe before 1600. It was a hardwood handle or lever, three to eight feet long, with a hook about 15 inches long swinging around it on a ring a foot or so from the end. The peavey, invented in 1858 by Joseph Peavey of Stillwater, Maine, had a hinged hook that would not swing around the handle. This was fitted into a tapered metal socket partway up the handle, which ended in a pointed spike. It was so much more efficient than the cant hook in logging and river driving operations that its use soon became universal. Now the terms "cant hook" and "peavey" are considered synonymous. With steam, logs were turned by a mechanical "nigger," a steel arm with teeth on the side at the top end, that operated from beneath and beside the carriage, controlled by the sawyer.

NOTABLE LUMBERMEN

In the latter half of the nineteenth century several lumber manufacturers left their mark on the province. One such man was German-born Francis Von Ellershausen, a mining engineer who came to Nova Scotia in 1862, attracted by reports of gold mining. After establishing the first stamp mill in the Mooseland district and being in charge of mining operations at Waverley, he decided that lumbering in Nova Scotia was more profitable than gold mining.

In 1864, with loans from European financiers, he started obtaining grants to woodlands and buying land in the St. Croix, Indian River and Ingram River areas in Hants County; ultimately he controlled about 60,000 acres. He built a large, almost palatial, home at the Windsor-Annapolis Railway (now Dominion Atlantic Railway) Stop No. 4 and named the place Ellershouse. Here he also erected 30 tenement houses and the St. Louise Union Church. Some 70 Germans came from Germany to work for him and he built a large steam sawmill at Stillwater Lake, now part of the Nova Scotia Power Corporation Five Mile Lake reservoir. The railway built a spur line to this mill. Soon afterward, Ellershausen built a large waterpowered sawmill south of the railway bridge on the St. Croix River at what is now Hartville and constructed two smaller water sawmills on the St. Croix River. At some of his mills he made hand buckets from slabwood. He also owned a mill for extracting tannin from hemlock bark.

Ellershausen had Nova Scotia's first groundwood pulp mill, a waterpowered operation built at St. Croix in 1875 under the direction of James Hughes and his three sons John, Joseph and Thomas. Over the next 40 to 50 years the sons would become important influences on the groundwood pulp industry in Nova Scotia. The Hughes family operated the mill until 1885, shipping the pulp to France and England. This mill was destroyed by fire in 1885 and was not rebuilt.

Ellershausen's business prospered until he became involved in copper mining in Newfoundland. In 1885 he raised capital for that enterprise from his Nova Scotia properties; the copper investment failed and he was declared bankrupt. Returning to Germany, he died in Berlin in 1914.

For a time T. G. McMullen, whose full name was Thomas Gotobed McMullen, was known as the "Lumber King of Nova Scotia." He started his own business before 1870 making carriages in Truro. With the profits from this business, he bought woodland and a portable sawmill not far from Truro. In 1892, McMullen bought 30,000 acres of land on Tatamagouche Mountain in Colchester County. His first mill there was built on a small river where he constructed a dam for log storage. The dam also provided water for a sluiceway to convey lumber from his mill 12 miles down the mountain to Debert Station. The sluiceway was a success and was still standing in 1920.

Besides this first mill, McMullen moved two portable mills to remote locations on Tatamagouche Mountain. When a bridge was required to cross a narrow ravine more than 30 feet deep to save a long log haul to one of the portable mills, he demonstrated his ingenuity by having the tops of spruce trees in the ravine cut off at the right height and, adding a few more upright supports with bracing between these and the topped trees, built his bridge with minimal effort and timber. This bridge stood for a number of years after the hauling was completed. In 1893, McMullen loaded 40 barks with more than 22 million board feet at $10 per thousand and shipped it to Liverpool, England, the destination of most of his lumber. He gave strict orders that no trees smaller than 12 inches diameter at the butt were to be cut during logging. In this way, he was able to log his land every 15 years.

McMullen served as member of the Legislative Assembly from 1897 to 1901 for Colchester County. He bought more land in 1902 in Hants County. Ultimately, between purchases and grants which he obtained, he owned 300,000 acres of land and operated 13 sawmills. One of his mills, located at Hartville, Hants County, was built by Francis Von Ellershausen about 1865. Three other mills were located at Brooklyn, Scotch Village and South Maitland, all in Hants County. Two of his five sons managed mill operations for him. McCullen had lumber interests outside central Nova Scotia as well. In 1879 the Shelburne Lumber Company was incorporated in Chapter 104 of the

Acts of that year, naming Hastings W. Freeman of Shelburne, Thomas G. McMullen of Truro, and Harold W. Covert of Halifax as owners. At one time he was supposed to have owned a large part of Boulardarie Island in Cape Breton and to have supplied the lumber for the St. Peters Canal.[46,47]

McMullen and three other men also formed a company and built 50 miles of railway, named the Midland Railway, between Truro and Windsor, bridging the Shubenacadie River at South Maitland. Five years later, McMullen bought out the interests of the railway company and later sold the railway to the Dominion Atlantic Railway. He also bought three vessels and used them to ship most of his lumber to England.

Before he retired, McMullen started selling his woodlands, mills and other interests. With prudent investments he became a millionaire. Until his death in 1925 he lived in a large beautiful home, "The Cedars," at the corner of Queen and Park Streets in Truro with his wife Jessie. McMullen Street in Truro and Lake Thomas of the Dartmouth Lakes still bear his name.

Another important lumberman of the time was Havelock McColl Hart, originally of Halifax, who operated a large waterpowered sawmill at East River Sheet Harbour in the 1880s and 1890s. This mill and Hart's woodlands were eventually sold to Rhodes-Curry of Amherst. Hart then had a small pulp and paper mill built at what is now Hartville on the St. Croix River in Hants County, under the name of the St. Croix Paper Company Limited, incorporated in 1897. This mill produced wrapping paper of brown and other colours and roofing paper from groundwood, rag and waste paper pulp. About 1908 the mill was destroyed by fire. It was later rebuilt and sold to W. H. Chase who owned about 40,000 acres of woodland in the St. Croix River area. Hart also operated a small steam sawmill at Bedford. He owned and operated a three-masted vessel, *The Hazeldine*, and the *Senlac*, a steamship.

Edward Doran Davison, born at Mill Village, Queens County in June 1819 to Samuel and Eleanor Davison, also left his mark on the province's lumber industry. Both his parents died when he was a boy and he was left in the care of Catherine (Katie) Doran, an astute maiden aunt. She conducted a lumbering and fisheries business at Port Medway until Edward, at the age of 18, took charge under her supervision. He continued with Mill Village as his base of operations until 1865; then, due to the destructive forest fires in the Medway drainage area, he moved his family and business to the small village of Bridgewater.

Some of the fires that encouraged Davison's exodus from Mill Village occurred in 1850 and are mentioned in the record of deed from heirs of William Foster to Jason and Edward Mack in March 1851.[48] The deed describes scattered lots on both sides of the Medway River from a point six miles south of Ponhook Lake down to what is now Charleston. It includes the following notation: "Fires having passed over the said lots of timber land and consequently rendered the timber perishable except that it be immediately used will become of little value." Judging from the locations of these lots, at least 10,000 and possibly 20,000 acres must have been burnt over. Parts of this forest, mostly white pine, had been cut to about a 12-inch top for logs to supply the Mill Village mills, although much of it was still virgin lumber at that time.

Davison had earlier built several sawmills on the Medway River; one was a steam mill erected in 1845. This was possibly the first of Nova Scotia's steampowered sawmills. After moving to Bridgewater he and his three sons—Henry, Francis and Edward—established the firm of E. D. Davison & Sons. They continued operations on the Medway River and built a new mill at Mill Village in 1870. This mill had two gang saws and produced 60,000 to 80,000 board feet per day. The lumber from their Medway mills was rafted to Port Medway where it was loaded on vessels for shipment.

After 1865, the company's operations were centred on the LaHave River. The family bought the Glenwood Mill property near Bridgewater, then owned by Captain Wyman and others, and in 1868 built a second mill at Bridgewater. They also bought the gang mill that James B. Patterson had built about 1830 on the Nictaux River at Alpena, Annapolis County, along with the woodlands he had acquired and sold to Pope, Vose & Company. Other mills that they acquired on the LaHave were located at Cook's Mills and Silver's Mills. Under the Davisons, each of these mills had one rotary and one gang saw. Upon completion of the Nova Scotia Central Railway in 1889, the lumber produced at the Alpena mill and the mills on the LaHave was shipped by rail to Bridgewater, at the head of tidewater, where it was loaded on vessels for shipment overseas.

With the establishment of E. D. Davison & Sons, other industries moved in and Bridgewater soon became a busy port. Davisons's lumber made up the bulk of the shipping. As the LaHave was too narrow for nearly three miles below Bridgewater for movement of vessels under sail, it was necessary to tow the vessels up and down this part of the river. At first, oxen were used. Often three vessels were towed together in tandem by as many as five yokes of oxen. In 1869, a steam tugboat replaced this tedious method.

The logging and milling operations of E. D. Davison & Sons employed about 350 men and 50 teams of oxen in the 1890s. The lumber output then averaged 12 million board feet and sold for about $120,000 annually.

E. D. Davison, a member of the Nova Scotia Legislative Assembly for several years, died in 1894.[49] His oldest son, Henry, died in 1896 and his second oldest son about 1901. The third son and heirs of the other sons then sold the family woodlands, as well as the sawmills and the business, to the

American Lumber Company of the United States in 1902. Headed by John Hastings of Michigan, this company operated in Nova Scotia under the name of Davison Lumber Company.

Alfred Dickie also had extensive lumber operations in Nova Scotia in the late 1800s and the early 1900s. Somewhat of a mechanical genius who could design and build equipment for his lumbering, he was quite successful both on his own and in partnership with a Mr. McGrath. Dickie owned a large sawmill at Stewiacke, one at Lawrencetown, Halifax County, one at Liscomb, Guysborough County, and mills at other places on the Eastern Shore.

Dickie and McGrath built a steampowered mill at Tusket, Yarmouth County in 1880, which operated until 1912. Logs were driven down the Tusket River and its branches from Tusket Lake, Barrios, Moose and other lakes to this mill, which produced up to 100,000 board feet per 12-hour day with a record single day's production of 110,000 board feet. Some of the lumber was loaded on vessels at Tusket but most of it was moved to Wedgeport ("Tusket Wedge") by scows and ox carts and loaded on steamships there. The mill had a single-cutting band saw, two single-cutting band saws in tandem operated by one sawyer, a heavy Sterns Oscillating Stock Gang (using 15 gauge saws) and a Sterns Double Edger. There was also a band resaw for sawing boards from scants and slabs, a Miller Double Lath Machine with a capacity of 50,000 laths per day, and all the other equipment required for an efficient mill. There were four boilers with iron and brick furnaces, a smokestack 125 feet tall and 5 feet in diameter, and an iron stack 65 feet tall. The furnaces were fueled by a system of iron chutes carrying sawdust from the mill. The buildings were all covered with galvanized iron except a general store, the company office, two boarding houses and a residence.[50]

A patent wood cutter sawed waste wood into 12-inch lengths for fuelwood at the rate of about 20 cords per day. The wood was then conveyed on carriers to cars on a Halifax and Southwestern Railway siding for distribution and sale in the province. The refuse wood and bark not consumed by the furnaces was moved by an endless chain conveyor to an open burner 500 feet from the mill.

In 1912, following the loss of an entire winter's logs in an Alfred Dickie operation in Labrador,[50],[51] the company eventually went bankrupt along with all of Dickie's companies.

S. P. Benjamin, another lumberman of considerable influence in the latter part of the nineteenth century, had a sawmill and grist mill built at White Rock on the Gasperaux River in Kings County in 1885; sawlogs were driven down the river from his own woodlands. A jack-ladder lifted the logs from the water within the holding boom (the log pond) to a log deck where some logs were rolled to the right to a gang saw and some to the left to a circular saw. After passing through an edger and trimmer saws, the sawn lumber went down two chutes to the ground where it was moved to storage and drying areas. Daily production of the mill was about 70,000 board feet per 24 hours. A large part of the lumber was in three-inch deals. The lumber was loaded on wagons and hauled by oxen and horses to Port Williams where it was loaded on schooners for shipment to world markets.[52]

The S. P. Benjamin Company Limited was not incorporated until 1897. The company executives were S. P. Benjamin (lumber merchant) and Foster W. Verge (woods boss), both of Wolfville, and John "Skipper" Cohoon (sawmill superintendent) of White Rock. The sawmill operated day and night during the summer months until 1900 when it was dismantled and moved to Falmouth, Hants County where it operated for some years. The woodlands around Gasperaux Lake were eventually sold to the Nova Scotia Light & Power Company.

Eighteen miles inland from Weymouth, the settlement of New France, Digby County was established near Langford Lake in 1894-95 by the family of Emile Charles Adolphe Stehelin. Emile Stehelin, who held an engineering degree, had been a successful felt manufacturer in France and had served as a major in the French Army in the Franco-Prussian War of 1870. While in the army, he became a close friend of Gustave Blanche who later became an Eudiste priest and one of the founders of St. Anne's College at Church Point, Digby County. Stehelin, who married Marie Therese de Buisson of Marseilles in 1869, was the father of nine sons and three daughters born between 1869 and 1886. Through the influence of Msgr. Blanche and reports of advantages in lumbering in Nova Scotia sent him by his second oldest son, Jean, who had come to Church Point in 1894, Stehelin and his family decided to move to Canada.

In 1894 Jean bought 700 acres of woodland. That fall Acadians employed by the Stehelins built a sawmill just upstream from Langford Lake. The mill had a gang saw with 14 six-foot blades, an edger, trimmer, planer, shingle mill and lath machine. The capacity was 15,000 board feet per day. Two dams were built and the mill was powered by several water turbines of different sizes. The shingles and lumber required for building the settlement were manufactured at this mill.[53] A small electric power plant, one of the first in Nova Scotia, was added in 1895, with a suitable sluice and turbine to generate power for 400 lighting outlets, to operate only at night. It was installed by the General Electric Company at a cost of $400, excluding wiring and poles.

In December 1894 three of Jean's brothers joined him. They learned woodcraft and lumbering from their uneducated but ingenious Acadian companions.

The boys' father and mother arrived in June 1895 and Emile Sr. oversaw construction of more permanent buildings from plans he had prepared before leaving France. The buildings included Major Stehelin's large home with bathrooms, lavatories and modern indoor plumbing of the time, a spacious two-storey workmen's house, a large barn with a pigeon loft to house 10 horses and 10 cattle, and several other buildings, including a chapel and a number of dog kennels. By February 1896 all the Stehelin family was at New France. The men and boys were kept busy in the fall and winter with logging and hunting, in the spring with trout fishing and the log drive, and in the summer with sawmilling and farming. In 1897 a portable steam rotary mill, with a daily capacity of 15,000 board feet, was purchased. This was moved from stand to stand, but the stationary mill at Langford Lake continued operating at full capacity. By that time, the Stehelins had acquired over 3,300 acres in grants from the Crown so that they owned a total of over 4,000 acres of timberland.

In the spring of 1896 they decided that hauling lumber over the rough rocky roads with horses and oxen was too slow and laborious, so they built a railway to Weymouth. That summer a 40-foot right-of-way, with a maximum grade of 6 per cent, was surveyed and purchased from the various landowners. By November the right-of-way had been cleared to Weymouth and one mile of wooden track laid. Sleepers 10 feet long were laid three to four feet apart and on these were spiked spruce rails four feet six inches apart. Piers were built, as high as 15 feet in some sections, for bridges and embankments. The railway was completed only as far as Danvers, more than five miles from Weymouth, because from there to Weymouth, where the lumber was shipped, the public roads were better.

The rolling stock had cast iron wheels seven inches wide with four-inch concave flanges. They were mounted on axles with sufficient play to allow for variations in the width of the track. The first locomotive, the "Firefly," was homemade, fashioned from an old stationary boiler with a 20-horsepower engine mounted on a truck. Power was delivered to the wheels by an intermediate crank wheel. The freight cars were 20 feet long on two trucks with four wheels each. That fall the locomotive "Maria Theresa," built for Stehelin by Robb Engineering Company Limited of Amherst in 1897, started service. It had four cylinders of 20 horsepower each on two trucks of four wheels each. The drive wheels were 36 inches in diameter and the tender was separate on four wheels. The locomotive and tender cost $3,300 F.O.B. (free on board) Amherst. This engine did not work well until after it was returned to Robb Engineering, where remodelling made it much lighter. It operated at New France again that fall. Both engines were wood burners until 1899, when the "Firefly" changed to oil. While burning wood, these locomotives started several forest fires; sections of the tracks were burned twice.

The line was called the New France and Weymouth Railway and cost about $3,000 per mile to build. There were two sidings at New France, and stations at Lake Doyle, Riverdale and Woodville (now Danvers). At each of these locations the Stehelins had portable mill settings. Two coaches carried passengers. One was the "Caribou," accommodating 20 passengers, and the other was a small car carrying four people.

The system worked well for some years but the tracks deteriorated and maintenance costs were high. The Stehelins had expected some revenue from their railway other than from hauling their own lumber, but there was little of this. From 1897 to 1907, annual lumber production by the Stehelins never fell below a million and a half feet. A third of the lumber went to the British market as deals and the remainder as boards to South America. Demand for lumber fell in 1907 and that year the railway was abandoned.[53] There is now little trace of the equipment. An engine boiler lies near the location of the barn at New France; the larger coach was used as a hunting camp for some years.

Other lumbermen or companies operating in the late 1800s included the Southampton Manufacturing Company comprised of John Bragg, Richard Boggs, James Tucker and John D. Davison, incorporated in 1875, and the Nova Scotia Timber Company Limited, comprised of John Grant of Boston, Daniel Lewis of New York, F. B. Wade of Bridgewater and Hon. William H. Ray of Clementsport, incorporated in 1893. A large steam sawmill also operated in the name of the Alpine Lumber Company near the LaHave River below Bridgewater, but financial difficulties ended this company in 1883. In 1889 Henry Haverstock, Jr. bought from Norman and Jonathan Hayes woodlands and a mill which the Hayes had built at Pockwock, Halifax County in 1850. This mill produced only about 400,000 board feet of lumber, boxes and barrels per year; it was, however, the start of a considerable industry in the Pockwock-Hammonds Plains district. In the late 1800s and early 1900s, as many as 30 mills were producing mostly boxes and barrels there, operated largely by Haverstock and Morin. At least one mill operated by Haverstock Brothers Limited at Hammonds Plains still makes such items as wooden boxes and pallets.

The Whites, who came to Nova Scotia from New England, had large lumbering operations at Apple River, Cumberland County, and the Barnhills, also from New England, had a large sawmill at Two Rivers in Cumberland County. A forest fire in 1908 destroyed most of the Barnhill property; the Barnhills then started operations in Newfoundland, which ultimately proved disastrous. The Bragg family of Collingwood Corner, Cumberland County also conducted lumber operations on a large scale for generations, as did the McLelans of Oxford, Cumberland County. Roderick MacGregor also lumbered in Pictou County for many years.

The Sutherland steam sawmill, built near Denmark in Colchester County, by Alexander Robert Sutherland in 1894, was reopened in 1979 by the Nova Scotia Museum. When originally built it replaced his first mill, a portable steam mill, which was destroyed by fire. With his brother, John Thomas, he organized the firm of Sutherland Brothers & Company, making sleighs, sleds, carriages and producing house doors and sashes. They also did custom sawing.

In 1895, J. Arthur Miller, inventor of Miller's patent barn door fastener, had a steam saw and planing mill as well as carriage factories and a tannery built in Bridgewater. John and David Coops built a waterpowered gang mill at Brooklyn, Queens County in 1880. This was changed to a steam mill about 1895 and was eventually sold to John W. Lowe in 1910, who changed it to a rotary sawmill. George E. M. Lewis, believed to have been a sea captain, and his brother John originally came to Nova Scotia from Maine. They acquired a considerable acreage of woodland in eastern Halifax and western Guysborough counties in the late 1800s and early 1900s. They had a hardwood peg factory on the East River Sheet Harbour at Lewiston, a village long since abandoned.

Lumbering was sometimes conducted by one family through several generations. The Freeman family of Greenfield, Queens County was one such family. Family members have been building and rebuilding sawmills since 1832. Greenfield's first settler was Samuel Hunt, who arrived there in 1830. His brother-in-law, Gorham Freeman, followed two years later and built the first of the Freeman sawmills. A shingle mill was added in 1845 and in 1868 stave and grist mills were constructed east of the falls.

RAFTS

Squared timber rafts were a familiar sight on the Ottawa River in the late nineteenth century, but few know that Nova Scotia was the scene of two spectacular experiments in ocean shipment of round timber by raft. A similar experiment had been attempted from Quebec 50 years before but had failed. The two Nova Scotia shipments were launched in 1887 and 1888 by Hugh R. Robertson of Saint John at Fingerboard Beach, near Joggins at the mouth of Cumberland Basin—hence the term Joggins Rafts.

The December 17, 1887 issue of *Harper's Weekly*, a United States paper, describes the undertaking:

> The steamship MIRAND [sic] of 1,500 tons left New York under charter for the purpose of towing back to New York a prodigious raft of logs from Port Joggins, Nova Scotia.

> The raft contains 25,000 sticks of spruce and pine timber, from 35 to 95 feet in length, and a great quantity of beech, maple and birch timber, making a total of 4,500,000 bd. ft. The diameter of the sticks runs from 12 in. to 36 in. at the butts, 6 to 10 in. at the points. It cost the owner, Mr. James D. Leary, of New York between $31,000 and $32,000 when launched and ready to tow, and the contract price for towing it to his basin at Newton Creek, Long Island opposite New York, is $3,500, exclusive of the cost of the hawsers. The method of constructing the raft is new and has been patented in this country, Canada and Europe.

Unfortunately, the S.S. *Miranda* ran into one of the North Atlantic's severe winter storms. The tow-line, a 15-inch hemp hawser, parted and the raft fell apart, scattering timbers over the ocean.

Undaunted by this misfortune, Leary arranged for the second raft. Logging for it started on February 20, 1888. According to the September 1, 1888 issue of *Scientific American*, this raft arrived in New York Harbour August 11, after a voyage of 700 miles, which took 11 days. This cigar-shaped raft was 595 feet long, 55 feet wide and 38 feet deep, tapering to a diameter of 10 feet at each end. It contained 22,000 timbers averaging 40 feet long, comprising an estimated three million board feet and weighing about 15,000 tons—enough cargo for 44 vessels. It was fastened together by a heavy steel chain through the centre from end to end, with cross-chains running in all directions at 10-foot intervals, clamped to the outside tier of piling by wooden crossarms. Heavy steel cable also encircled the outside of the raft at 10-foot intervals.

These rafts of timber and all their expenses were paid for by James D. Leary of Brooklyn, New York. A builder of wooden ships, docks and piers, he required long timbers for masts and piling. Normally he shipped timber by rail from Michigan, but for long timbers requiring three or four flat cars, this was very expensive. His undertaking was quite profitable, but because steam and iron ships were beginning to replace wooden sailing vessels, no further rafting attempts were made.

CHAPTER 22

PULP MILLS

PULP MILLS

According to C. Bruce Fergusson, pulpwood was first exported from Nova Scotia in the 1890s, although several pulp mills had existed earlier.[28] One of Nova Scotia's earliest groundwood pulp mills was built at Salter's Falls on the Medway River at Charleston, Queens County in 1880. (Years before this, Robert, Job and Lodewick Burnaby had owned a sawmill at the Salter's Falls site and another one at the outlet of Burnaby Lake, eight miles northwest of Salter's Falls.) The Hon. A. G. Jones and Dr. A. P. Reid of Halifax were the chief promoters of this pulp mill, which was incorporated as the Nova Scotia Wood Pulp and Paper Company Limited. Lawrence Howlett was the first mill manager. Shortly after the mill at St. Croix burnt in 1885, John S. Hughes replaced Howlett as manager of the Charleston mill and held this position until he left to supervise the operations of the new Milton Pulp Company mill in 1893. The pulp mill was eventually destroyed by fire (in June 1903), but it was rebuilt and operating again soon afterward. Its original production was reported to have been about 1,500 tons of air-dry pulp per year. In the early days of the Charleston mill, baled pulp was moved about eight miles to Port Medway on wagons or sleds drawn by oxen or horses, then loaded on steamers for shipment to the United States. During the two World Wars the pulp was shipped by rail to the Scott Paper Company at Chester, Pennsylvania. Fire destroyed the mill again in 1947, putting 50 men out of work.

Canada's first sulphite pulp mill was built at Sheet Harbour, Halifax County and cooked its first digester of pulp in January 1885.[68] This mill was built and operated by the Halifax Wood Fibre Company, organized by William Chisholm, an Antigonish lumberman who had some 60,000 acres of woodland on the Sheet Harbour rivers and built this pulp mill a mile downstream from one of his sawmills on East River.

The pulpwood consisted of spruce slabs from Chisholm's sawmill, conveyed to the pulp mill on horse-drawn cars on a tramline built for this purpose. The slabs were debarked by three horizontal planing machines, the wood chipped, and the chips cooked with the sulphurous liquor in the digesters. Roughly 3,100 pounds of wood, equal to about 1.3 cords of roundwood, was required to produce one ton of air-dry pulp. Pressed into bales of 200 pounds each, the pulp was shipped in schooners to Massachusetts. Twenty to 25 men worked in 12-hour shifts. Unskilled labour was paid 7 to 10 cents per hour and skilled men received 15 cents.

For two years the mill ran well, producing approximately eight tons of dry pulp daily, and profits were good. The slabs and edgings from Chisholm's sawmill were purchased under contract at $3 per cord delivered. Dissatisfied with this, the company's board of directors discontinued using this material. Spruce logs were produced farther up East River, driven to the pulp mill and slashed at a newly installed slasher. They were then sawed into boards, debarked with the planers, and chipped.

In 1890 the United States tariff on sulphite fibre was raised to $6 per ton, making production of this material for export from Canada unprofitable. The mill closed down in January 1891 and for the next two years lay idle. About 1893 the Hon. A. R. Dickey of Amherst, who owned 88,000 acres of woodland around the Sheet Harbour River, bought the sulphite mill property. He planned to build a 20-ton sulphite plant but shortly afterward the old mill burnt down, ending Sheet Harbour's sulphite pulp industry.

Chisholm, the man responsible for this enterprise, continued lumbering successfully. It was well known that he built the convent for the Sisters of the Good Shepherd in Halifax. He also gave a great deal of attention to improving Point Pleasant Park in Halifax. In 1901 Chisholm was appointed to the Legislative Council of Nova Scotia. He died in 1909 at the age of 77.

Another early groundwood pulp mill was built at Rapid Falls, about two miles up the Mersey River from Milton in 1893 by the Milton Pulp Company, a group of Halifax men headed by the Hon. A. G. Jones. The mill started operations in January 1894 with Walter Jones as manager and John S. Hughes as superintendent. Pulpwood was purchased at $2.50 per cord delivered to the mill. Mill wages were $1 per 12-hour day. The mill ran two shifts daily, producing 38 tons of air-dry spruce-fir pulp each day. At times, a small percentage of poplar was added to the softwood. At first the baled pulp was team-hauled 2 1/2 miles to the wharf of J. G. Morton & Son below Milton, where the pulp company had a large warehouse built. Later it went by rail to a new pulp shed at Liverpool. The pulp was moved to Halifax by schooners owned and operated by Captain John Hart, and reloaded on steamers at Halifax for shipment to England. The pulp price at this time was about $20 per ton F.A.S. (free alongside ship, i.e., not loaded). With a substantial dam at the outlet of Lake Rossignol, Nova Scotia's largest lake, this company enjoyed a more continuous supply of water than did most pulp mills in Nova Scotia in the latter part of the century.

Following construction of the Liverpool and Milton Railway, the Milton Pulp Company built another pulp mill with a capacity of 15 tons per day at Cowie's Falls, just north of Milton, on the site of the old Collins sawmill which had fallen into ruin. In 1897 the pulp company was reorganized under Chapter 95 of the Acts of that year and renamed the Acadian Pulp and Paper Mills Company Limited. The Hon. Alfred G. Jones started this company and the directors included John F. Stairs and Benjamin F. Pearson, owner of the *Halifax Chronicle*. The mill went bankrupt in 1903 following a drop in the price of pulp; the Indian General Investment and Trust Company of London, England then bought the property for the bondholders.

New Germany was the site of Nova Scotia's fourth groundwood pulp mill. It was built in 1893 at Morgan Falls on the LaHave River by the Morgan Falls Pulp Company, comprising the Hon. A. G. Jones and his sons and John S. Hughes. Joseph Hughes was the first manager of this mill. At the start of production it was grinding an average of 14 cords of spruce and fir pulpwood per day. By the first week in May 1895 it was producing 1,206 bales weighing 200 pounds each—slightly more than 20 tons of pulp per day. In 1897 the Morgan Falls Pulp Company was sold to the Acadian Pulp and Paper Mills Company Limited. When this company went bankrupt in 1903, the mill was sold to Francis and A. F. Davison, who bought the Charleston pulp mill about the same time. As with the Charleston mill, this New Germany mill was known as the Davison Pulp Mill while it was owned by the Davisons. It later changed hands again (about 1918), becoming the property of the LaHave Pulp Company with its head office at New Haven, Connecticut. At that time it was equipped with four grinders and four 72-inch wet machines and produced 20 tons of air-dry pulp per day. Most of the pulpwood was purchased from farmers and other woodlot owners.

In 1894 S. Fawes Smith of York, Pennysylvania, formed the Sissiboo Falls Paper Company, bought woodland and the land for the mill site, and built a three-grinder mill with four wet machines at Sissiboo Falls, some eight miles up the river from Weymouth, Digby County. In 1899 Charles Burrill of Weymouth organized the Sissiboo Pulp and Paper Company which bought this mill and added another grinder and wet machine.[56] This company built a second and larger groundwood mill at Weymouth Falls, 3 1/2 miles above Weymouth. Shortly afterwards, these mills suffered severe flood damage and operations were suspended from 1902 to 1904 when the pulp mills and woodlands were purchased by G. D. Campbell & Company, a lumbering firm in Weymouth.

CROWN LAND POLICY

An act passed in 1851 discussed duties of the Commissioner of Crown lands and Surveyors, the price of ungranted land, voiding of grants and reservation of land for Indians. Section 10 of this act gave authority to the Governor in Council to sell or lease any Crown land at any price, and for such tenure, time or use as might be deemed expedient. This appears to be the first provision for leasing Crown land—although no leases were issued until a Lease Act was passed in 1899.

In 1875, Chapter 19 of the Acts authorized the Governor in Council to grant more than 2,000 acres to a single party for lumbering. Two years later, legislation (Chapter 3 of the Acts of 1877) provided for the transfer of the duties of the Commissioner of Crown lands to the Attorney General.[17] Five years later Crown land laws concerning grants were amended. The price of all Crown lands granted was to be $40 per 100 acres. Land that had been occupied and improved for two years prior to the act was priced at $10 per 100 acres. The following year provincial policy respecting Crown lands changed significantly. Chapter 3 of the Acts of that year provided for the leasing of timberlands instead of the issuing of grants. Leases were issued at not less than 40 cents per acre for 20 years, with option for renewal at the same price. The lessee had the right to cut trees to a minimum butt diameter of 10 inches. For an additional 10 cents per acre, the diameter limit could be reduced to five inches.

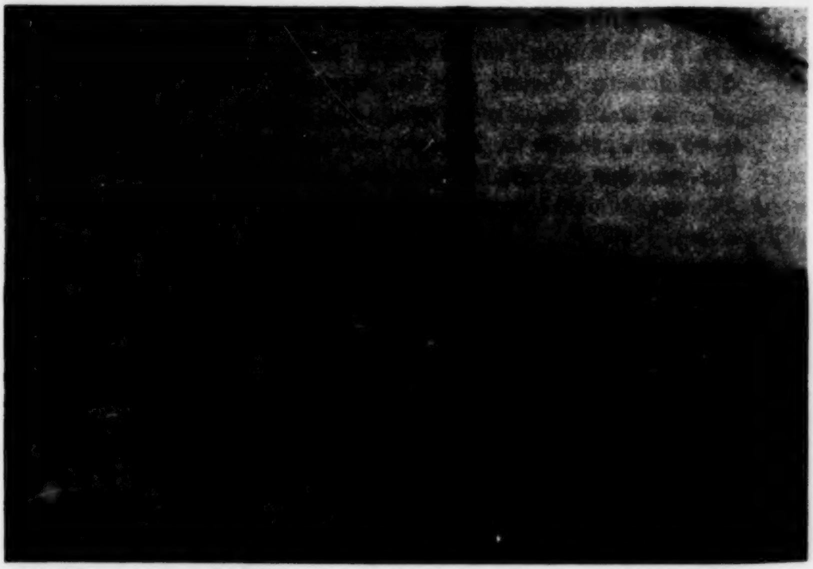
Under Section 5 of this act, the Governor in Council was empowered to make a lease of Crown land on terms other than those provided in the act. This was to apply in cases where lands proposed to be leased were of inferior quality and the party proposing to lease the same was prepared to spend money to develop the land or to erect mills and machinery for manufacturing pulp or other wood products. Under Section 7, the Governor in Council was authorized to purchase, at a rate not exceeding 25 cents per acre, any land that had been granted for lumbering purposes.

Shortly after this act was passed, the so-called "Big Lease" was issued to D. F. Emery, E. L. Sanborn and R. B. Blodgett of Boston, Massachusetts for a term of 99 years. According to the returns of the Crown Lands office in Halifax, the lease covered 359,000 acres in Victoria County and 151,000 in

Inverness. A Dominion Government report showed this land as being 240,000 acres of barren and 270,000 acres of small growth, mostly fir.[51,57] Because of the steep slopes of the highlands which comprised most of the lease, the wood was mostly inaccessible until after the Second World War, when a motor road was built to the plateau and trucks became the main means of transporting wood. Under the terms of the lease, the lessee was to pay an annual rental of $6,000 and build a pulp mill in each of the two counties; no unmanufactured wood was to be exported. No royalty was paid when trees were cut.

While his name does not appear in the original lease, F. J. D. Barnjum, named as manager for the lessees, was hovering behind the scenes. In the end he reaped a handsome profit when he sold the lease to Hugh Chisholm, President of the Oxford Paper Company. Chisholm made a still greater profit when he in turn sold the lease to his own company. It was not until 1904 that the terms of the lease were altered. One rossing mill was substituted for two pulp mills; rossed, peeled or handbarked wood was classed as manufactured wood that could be exported from the province.

While the issuance of timber leases instead of grants in fee simple was a timely change in policy, the selling of leases for a lengthy term, with no stumpage payments when timber was cut, was a shortsighted and costly blunder.[51]



Oxford Paper Company debarking mill and management staff at Murray, Victoria County.

Collection of R. S. Johnson

CHAPTER 24

FISH, WILDLIFE AND RELATED LEGISLATION

Nova Scotia probably had the first fish and game protective society in Canada—and the second in North America. It was organized in 1853 as the Game and Inland Fishery Protection Society of Nova Scotia, and was succeeded by the People's Fish and Game Protective Association. Campbell Hardy, Captain of the Royal Artillery at Halifax from 1852 to 1867, was a founding member. He wrote that, despite its formation, the fish and game laws of the time were "of no account," that Indians and settlers regularly fished at night by the light of birchbark flares, that salt water netting of salmon was destroying fishing stocks, and that Indians were killing many salmon with "the murderous and forbidden spear." Although salmon were once plentiful in the Sackville River at the head of Bedford Basin, Hardy wrote in 1868 that "the Sackville River offers no sport to speak of now for the sawmills and their obstructive dams have quite cut off the fish from their spawning grounds." In 1854 legislation was passed providing for regulations to prevent mill refuse—a major contaminant—from being dumped into rivers. The practice continued, however, to a small extent on a stream in north Queens County and to a much greater extent on the Northeast River in western Halifax County until well into the 1930s.

The largest salmon came from the St. Mary's River in Guysborough County; according to Hardy, 60-pound salmon were caught there in the 1850s. By 1872 a considerable amount of freshwater fish was being taken in Nova Scotia:

Fish	Amount	Price/Unit	Total Value
Salmon (salt or smoked)	3,529 barrels	$18.00	$63,522
Salmon (fresh and iced)	554,905 pounds	0.125	69,363
Trout	13 barrels	9.00	117
Eels	1,016 barrels	17.00	17,272

In the second half of the nineteenth century, legislation also began to reflect a growing concern for the preservation of game animals like moose and caribou, and for birds such as pheasant and grouse. Apparently, pheasants were introduced to Nova Scotia about 1856; an act was passed that year concerning their preservation. Six years later, legislation was enacted to prevent the destruction of smaller species of birds by prohibiting people from hunting or selling them. Acts from 1851 to 1894 set out hunting regulations to ensure the preservation of such "useful birds and animals." Bounties continued, however, on bears, lynx, wolves and wildcats.

Legislation pertaining to furbearing mammals was introduced in 1862. Chapter 22 of the Acts of that year prohibited the killing of otter, mink and musquash (muskrat) between May 1 and November 1. Eight years later, an act of the legislature allowed anyone to catch any number of mink for breeding purposes; this afforded a bit of protection to mink breeders. Concern for the beaver population was reflected in Chapter 13 of the Acts of 1874, which prohibited the killing of beaver from September 1, 1874 to September 1, 1877. Beaver were reported to be extinct in Pictou County in 1877.[17] In 1894, Section 4 of Chapter 2 provided for a closed season on beaver and otter.

Big game animals figured prominently in the legislation of the time. Chapter 28 of the Acts of 1856 enacted the first provincial big game season for moose, extending it from September 1 to February 1. The penalty for illegally killing a moose was set at no more than £5 and no less than 40 shillings or a jail term of from two to six days. Further limitations were placed on moose and caribou hunters in 1862. Chapter 23 of the Acts of 1862 stated, in part, that no one was permitted to kill more than five moose or caribou in any one season, to knowingly kill a cow moose between January 1 and September 1, or to set snares or traps to catch these species.

In 1874 the Acts provided for a closed season on moose from September 1, 1874 to September 1, 1877. Chapter 13 of the Acts of that year provided for the appointment of commissioners, wardens and deputies and set forth their powers, duties, and compensation. Justices of the peace were to enforce the legislation.[17]

Chapter 6 of the Acts of 1875 again changed the law for preservation of "useful birds and animals." It provided for half the penalty for an offence under the act to be paid to the prosecuting commissioner or warden and a penalty for hunting moose or caribou with dogs. It also became lawful for any person to kill a dog that was hunting a moose or caribou. Provision was made for the appointment by the Governor in Council of a chief game commissioner for the whole province, to be paid as determined by the Governor in Council.

In 1877 the game laws were again amended, under 21 sections. Section 3 stated that no hunting party could take more than three moose and five caribou. Section 18 provided for a non-resident hunting license; however, officers of Her Majesty's Service who were members of the Game and Inland

Fishery Protection Society of Nova Scotia were exempt from license. Chapter 2 of 1894 amended and consolidated the acts relating to the preservation of useful birds and animals.

The season for moose and caribou from 1894 to 1897 was September 15 to January 15, with a bag limit of two moose and four caribou per licensed hunter. Section 35 provided for a closed season on cow moose. Under Section 11, deer and "American elk" were protected—although it is doubtful that elk or wapiti were ever in Nova Scotia.[17]

In 1896, the Game Act was again amended in Chapter 4. The word "game" was defined. Deer or American elk, Newfoundland hare or "jack rabbit" were protected, as were pheasant, black cock capercaillie, ptarmigan, sharp-tailed grouse, spruce partridge, and chukar partridge. These exotic game species apparently had already been, or were expected to be, introduced into Nova Scotia. There is no other mention of elk, jack rabbit, black cock capercaillie or sharp-tailed grouse ever having been in the province. There appears to have been some confusion in this legislation as moose have, at times, been called elk. That same year the season for moose and caribou in Cape Breton was closed until 1899.

The status of the province's moose and caribou populations was commented on by the Nova Scotia Game Commission in 1910. Specific reference was made to the impact legislation had had on these two species.

> Twice in the last century the moose were nearly extinct in the Province. The last occasion was nearly forty years ago after a winter of exceptionally heavy snow. Radical changes were then made in the law and a closed season of three years imposed. For more than thirty years, under improved conditions and more restrictive laws, it has been unnecessary to have a closed season throughout the year. It would, perhaps, be too much to say that there has been a steady increase throughout that period, but probably at no time since 1873 has there been a serious decrease.

In 1901 the Game Society Report included the following notation: "It would appear that all major changes in the status of big game in the Province have progressed from the southwestern counties toward the northeast. The disappearance of the caribou was no exception. It occurred first in the southwestern counties 1870-1901." There appears to be three reasons for this disappearance: the moderating climate, extensive forest fires, and increased hunting pressure—although this pressure was probably no worse in the southwest than in some other parts of the province. Caribou thrive in colder climate than do the white-tailed deer and as the weather grew warmer in the province in the late 1800s, the southwestern part had the mildest weather.

While the caribou began to disappear, Nova Scotia's white-tailed deer population began to establish itself. F. A. Harrison, in charge of the Department of Lands and Forests following the election in 1933 and the first Deputy Minister of Lands and Forests, stated that he had seen white-tailed deer in Cumberland County about 1890. They apparently moved into this region from New Brunswick. He also said that caribou had been shot on the Gundalow Plains in that county at that time. Apart from natural ingress across the isthmus of Chignecto, white-tailed deer were introduced into Nova Scotia at Lake Jolly, Digby County by Major John Daley in 1894, using five or six male and the same number of female deer captured in New Brunswick. In 1910 an additional five or six were released in Yarmouth and Annapolis counties; two others were let go near Harrietsfield, Halifax County about the same time. In the late 1800s, a Mr. Downs of Halifax held several deer in captivity. These too were probably released about 1894, further helping to establish white-tailed deer in Nova Scotia.

NATURAL DISASTERS

Forest fires, thunderstorms and pests took their toll of timber during the latter half of the nineteenth century.

According to the diary of Sylvanus Morton of Milton, the spring of 1860 was "a remarkable dry time for more than four weeks with not a shower to lay the dust; great raging of fires and a great damage to timberlands." Some 90,000 acres were burnt between Lake Rossignol and Medway River and most of this was land which, according to Titus Smith in 1801, had been burned over about 1720. Also in the spring of 1860 about 20,000 acres were burned south of the Sissiboo River in Digby County, until rain put out the fires on May 19.

In May 1865, Daniel Moody of Milton was working on a log drive on the lower Mersey River. He went ashore and, finding the black flies very bad, lit a smudge fire. The weather was dry and his smudge fire became a conflagration. This fire, for a long time known as the Dan Moody fire, burned about 20,000 acres from Milton to Upper Great Brook and Ten-Mile Lake, between the river and what is now known as Highway No. 8. Following a summer of drought that year, "the woods were all on fire" in parts of Queens County by September. Part of Liverpool was destroyed and the villages of Milton and Port Medway were saved only by a heavy rain just as the fires reached their outskirts. At Southwest Cove of Medway Harbour 11 homes and 19 other buildings were destroyed.

On October 5, 1869, a destructive hurricane swept up the Bay of Fundy. It was known as the Saxby Gale because it was forecast a full year before by Capt. James Saxby of the Royal Navy. Amazingly, his forecast was exactly correct. The storm struck the American coast near Cape Hatteras and sank or stranded more than 150 vessels from Washington to the Bay of Fundy. The tides reached a record high in the bay, flooding most coastal towns and villages; at Great Village, Nova Scotia, tides were said to have reached a height of 100 feet. A tidal wave swept over the Tantramar Marsh, destroying cattle and barns, silting up the harbour of Sackville, and drowning some people. Meanwhile the Atlantic coast of Nova Scotia had little more than an ordinary October storm. Falling trees damaged telegraph lines and whole tracts of forest trees were uprooted. Apparently, the worst of the damage in Canada was in southern New Brunswick and northern Nova Scotia.

The "August Gale" of August 24, 1873, reported by George MacLaren in his *Pictou Book* as "The Big Blow," lasted 19 hours, gusted to 70 miles per hour and left four inches of rain in its wake. This storm caused widespread damage on the northern mainland of Nova Scotia and in most of Cape Breton, destroying many buildings and bridges and wrecking or sinking many vessels. Forest damage was extensive and MacLaren reported, ". . . after this storm, it was noticed that all over the country for miles inland the trees were wilted and turned brown." This was caused by salt spray carried by the terrific gales.

Thunderstorms have generally not been as frequent in Nova Scotia as in most parts of Canada. Although Nicolas Denys wrote of them as being severe and causing forest fires in the 1600s, they usually do not reach the intensity experienced elsewhere. In his history of Annapolis County, W. A. Calnek wrote of terrific thunderstorms occurring in June of 1891 and 1892, causing much damage to buildings and trees. Other parts of Nova Scotia had numerous wild thunderstorms in 1897. Calnek also described a cyclone August 3, 1895 west of Bridgetown that tore large trees up by the roots and carried them some distance. Its track was 100 yards wide and six miles long.[16]

Outbreaks of defoliating insects also left their imprint on the province's timberland in the late 1800s. The larch sawfly, probably an introduced insect, was first recorded in North America at Boston, Massachusetts in 1880. It now occurs throughout the range of larches on this continent. The original outbreak of this defoliating insect, which occurred in the 1880s, killed nearly all the mature larch throughout America. There have been sporadic infestations ever since. In some parts of the province there was time enough between infestations for larch to reach 12 or 14 inches in diameter by 1950. Larch—*Larix laricina*, locally called tamarack, hackmatack or juniper—is about the most durable wood grown in Nova Scotia, especially where used in contact with the soil. It is still much used for fence posts, but little has been sawn for sills and other timbers close to the ground since its comeback following the original infestation. It is now used as pulpwood to a limited extent and in the manufacture of hardboard.

The eastern spruce beetle occurs throughout eastern spruce forests and breeds in red, white and black spruce. Normally, windfalls and standing overmature or weakened trees are attacked. But in epidemics, nearly all spruce trees are attacked regardless of size or vigour. Signs of attack are wood dust and pitch tubes on the bark and fading and dropping of needles. Numerous outbreaks of this pest have occurred in eastern forests. One, from 1897 to 1901, killed more than a billion board feet of valuable spruce timber in New England and eastern Canada. Since then there have been many small infestations in Nova Scotia in overmature pasture spruce from 60 to 70 years old and in red spruce forests more than 150 years old.

7 THE TWENTIETH CENTURY: 1901-1930

From 1900 to 1914 Nova Scotia's forest industries prospered. Following the end of the War, however, most fell into economic chaos. By 1923 business was booming again and reached unprecedented heights until the October 1929 stock market crash, which ushered in the worst economic depression the world had ever known.

SAWMILLS

NEW TECHNOLOGY

Just when the crosscut saw displaced the axe for felling trees and cutting them into logs is uncertain. In his *History of the Maine Woods*,[43] Coolidge stated he had reports varying from 1840 to 1880, and Robert Pike wrote in his *Tall Trees, Tough Men* that Omar Sawyer, manager of timberlands for Hollingsworth and Whitney in New England for many years, put the changeover definitely in 1897. Pike stated that the saws were in universal use by 1900.[38] However, Purney Kempton, an elderly woodsman of northern Queens County, Nova Scotia, said his father told him that they came into use there in 1905. Added proof that crosscut saws were not used in western Nova Scotia before 1900 comes from the last drive of logs out of Frozen Ocean Lake in Annapolis County into Kejimkujik Lake, in the spring of 1901. All the deadheads (sunken logs) left behind in this and previous drives bear axe marks.[59]

The first crosscut saws had no raker teeth—special teeth regularly spaced among the cutting teeth and designed to clear sawdust from the kerf. When green timber was sawn, sawdust stuck in the kerf, causing the blade to jam. After the rakers were added, two men could fell and saw 20,000 feet of timber into logs in a day. With axes it took four men to produce the same volume.[38]

Further improvement came with the introduction about 1915 of one-man crosscuts for use in smaller timber. The bow saw or Swede saw, produced by the Sandvik Steel Company, was used in the Lake States as early as 1923 and in Maine circa 1927. By 1929 it was used in Nova Scotia, and was the best saw for manufacturing four-foot pulpwood until the improved one-man power saws became available about 1947.

About 1900, the perfected band saw came into use in some larger mills in Nova Scotia, producing more and better quality lumber than was possible with circular saws. A band saw is an endless beltlike strip of steel, toothed along one or both edges and running unidirectionally between two large pulleys placed one above the other. The principle had been known for many years but probably poor steel quality had prevented its use with big logs until about this time. The single-cut band saw—toothed on one edge—was used mostly in Nova Scotia until recent years but now the two-cut saw is common in modern mills. With the single-cut saw, the carriage has to return to its starting position for each new cut. The two-cut saw allows the logs to be sawn both coming and going.

From 1900 to 1914, sawmill production in Nova Scotia was steady. The local demand for lumber was small but there was constant shipping of spruce and pine deals to the United Kingdom. The winters were reliable for logging, and river driving conditions were good. Sawing was still done mostly by stationary mills at lakes or river estuaries. Timber remote from rivers and the few public roads was largely neglected, but the number of portable steam mills was increasing. In most operations, little hardwood lumber was produced, and only larger spruce and pine trees were cut—mostly with a minimum of 8-inch or 10-inch diameter. Slabbing was usually to a minimum 7-inch face. Fuelwood consumption was heavy and good quality hard maple and yellow birch was often used as fuelwood.

In 1912 gasoline-powered log haulers came into general use in the northeastern states, but it was some years before they were used to any extent in Nova Scotia. At first these all had tractor treads; later developments brought the large rubber tires.

Important legislation was passed by the Nova Scotia Assembly in 1904, requiring paid watchmen at portable mills and providing for the appointment of a chief fire ranger, with a small annual salary, for each municipality. The portable steam mills had been starting many forest fires. Firefighting costs and rangers' expenses were paid by the municipalities via a levy of 1/4 cent per acre on properties of 1,000 acres or more. If this did not cover the costs, the balance was paid out of municipal funds. Besides his duties as fire ranger, a chief ranger was also required to enforce the game laws. At this time the price of grants of Crown lands increased from 40 cents to 80 cents per acre, with the cost of the survey added to the price of the grant. The price of timber leases also doubled with the cost of survey added.

DAVISON LUMBER COMPANY

When Frank Davison and the heirs of the other members of the firm of E. D. Davison & Sons sold the woodlands, mills and business of this firm to the American Lumber Company in 1902, the latter changed its name to the Davison Lumber Company. The president of this company was John M. Hastings of Michigan and the head office was established at 1 Madison Avenue, New York City. The Nova Scotia office was just south of the east end of the Bridgewater Highway No. 3 bridge. This company continued to operate the E. D. Davison & Sons sawmills and they built what was probably the largest sawmill ever in Nova Scotia at Hastings, across Springfield Lake from Springfield, Annapolis County.[61,62] Two steam engines, of 600 and 700 horsepower respectively, powered the saws. This mill had one single-cutting edge band saw and a twin band saw (i.e., one with two parallel blades), one 41-blade gang saw and a lath mill. The mill also had edgers, cut-off and other saws. Most of the lumber was railed to Bridgewater and loaded on ships.

Everything about this mill was large. In the main boiler room there were five boilers of 250 horsepower each, and the pump house had one of 150 horsepower. Each carried a boiler pressure of 110 pounds. There were also seven steam engines. The main one had a flywheel 20 feet in diameter with a 46-inch face and ran at the slow speed of 84 r.p.m. The engine for the gang saw had 300 horsepower. Another engine of 45 horsepower ran the blower for the furnaces and one of 60 horsepower ran the generator. There was one of 84 horsepower for the planer-matcher, one of 30 horsepower for the filing room, and one of 30 horsepower for the machine shop. The mill's smokestack was 140 feet tall and 8 feet in diameter, the first 40 feet being of brick and the last 100 feet of steel. The water tank was 110 feet high and the waste wood burner 120 feet high and 24 feet in diameter. The latter had a water-jacket 40 feet up its sides to heat the water for the boilers and for the hot pond in winter. There was a complete sprinkler system in the mill and a large fire pump with a 12-inch intake pipe that could pump 2,000 gallons of water per minute to the water tanks and the eight 3-inch hose lines. Steam was maintained on the pump house boiler at all times.

The twin-band sawed cants for the gang saw, each log going through once with the centre of the log going to the gang and the two slabs to the resaw. If the twin-band saw could not supply sufficient cants to keep the gang in full operation, the single-band also sawed cants for the gang. When the twin-band kept the gang going, the single-band sawed one- and two-inch lumber. Two men rode the carriage for the single-band. There were 32 steam cylinders in the mill. The single-band band saw carriage piston rod was 40 feet long and eight inches in diameter. After the lumber was edged it was carried on live rolls to the trimmers and then to the sorting shed. After sorting, it was loaded on three-wheeled carts and hauled by horses along tramways to be piled. One tramline was a half mile long and the other about a quarter mile. The lumber stacked for drying was in piles 24 feet wide and sometimes 20 feet high. In 1909 the Davison Lumber Company letterhead included the following: "Lumber, Lath, Shingles, Hemlock Back, Spruce Pulpwood." Hemlock bark was in great demand at that time for tannin. Slabs and edgings went to the lath mill, which sawed over 50,000 laths per day.

The sawmill was built to saw 250,000 board feet in a 10-hour day, but the best daily production was 190,000 board feet in nine hours. The planer-matcher previously mentioned was a large P. B. Yates machine purchased in 1917 to dress lumber for U.S. Army huts being built in France. This would tongue-and-groove 300 lineal feet per minute and surface-plane 15,000 board feet per hour. This and an older model worked two 10-hour shifts per day, producing an average of 170,000 board feet per shift. Until the end of the First World War, output was loaded on cars and railed to Tidewater, New York.

Most of the logs to feed this mill were driven on three branches of the LaHave to the main river, where they were loaded on flat cars and railed about four miles to the Hastings mill. In winter, logs were railed directly from the woods to the mill and dumped into the enclosed steam-heated log pond. This company had nearly 40 miles of standard gauge railway, mostly in the upper LaHave watershed. One line extended northward as far as the head of South River, which drains into the Annapolis River near Aylesford. Besides a small rod locomotive with a passenger car attached, it operated two larger rod locomotives to haul logs and lumber. There were also two Shay locomotives, each with a boiler on one side and three upright engines on the other with a shaft extending along the side and cog gears to drive the wheels. The Shays were more powerful and could haul 10 carloads of logs up quite steep grades.

This railway system was named the Springfield Railway. The company at first had running rights on the Nova Scotia Central Railway between Springfield and Bridgewater; later, the rights were extended to the entire Halifax and Southwestern Railway.

Cavicci and Pagano, the firm which built most of the Halifax and Southwestern Railway, also built the first 10 miles of the Springfield Railway from Springfield Junction to Crossburn in 1903-04. Crossburn, named for Logging Superintendent J. W. Cross, was the first rail and logging headquarters, situated seven miles up the railway from Falkland Ridge. By October 1905 Crossburn boasted a warehouse, a machine shop, a five-stall roundhouse, a commissary and general office, four bungalows, a cook house, two dining rooms, a bunkhouse and a one-room school.

In November 1913, all railway equipment was moved from Crossburn to Hastings and all 14 families at Crossburn followed in the summer of 1914. In 1905 when the large sawmill had been built at Hastings there were 30 houses, a large three-storey cook house, a one-room schoolhouse and an office. Upon the move from Crossburn to Hastings in 1913-14, 15 more houses were built at Hastings, as well as a warehouse, store, doctor's office with two hospital rooms, a large clubhouse, and a second room for the school. The clubhouse had a bowling alley, two pool tables, a dressing room and a large dance hall which hosted a dance every weekend. From 1905 to 1914 there were 45 pupils in the school, with only one teacher for primary to grade 12. After the move from Crossburn there were 72 students with two teachers.

About 130 men worked at Hastings, including the mill crew, cook, doctor, storekeeper, office and warehouse staff. The company doctor made weekly trips to all logging camps besides caring for the Hastings residents. A single man paid 50 cents a month for medical services and medicines, and families occupying the houses paid $1.00 per month. House rent was an additional $1.00 per month and included electric lights; the power was switched off at 10:30 p.m.[61] In winter about 500 men worked in the woods from the several logging camps. During the winter of 1909 the company had one logging camp housing 125 men plus a transient log-loading crew of eight. This camp's two cooks and four cookees served 18,550 meals that winter at an average of seven cents per meal.[62] Kenneth L. Crouse, head cook and father of Lloyd Crouse, Member of Parliament for Lunenburg-Queens, recalled working long days—up at 4:00 a.m. and "lights out" at 9:00 p.m., for $1.00 per day.

Company president John Hastings remained in the United States, but Frank K. Brown was vice-president and had his headquarters at Bridgewater. David Kaiser of Detroit, Michigan—father of Henry J. Kaiser of United States industrial fame—became master mechanic in 1913. Wilbur B. Sherrard of Kentville was a crane operator in 1905 and logging foreman at the Shell Lake camp in 1908. He became assistant master mechanic in 1916 and later master mechanic. After 1921 he held an important position with the Dominion Atlantic Railway.

In 1914 a "Rapid Bernhart" crane was acquired for loading logs on flat cars. This was indeed a speedy loader. Two years later a Lombard steam log hauler arrived, equipped with caterpillar treads under the cab and firebox and with runners under the front end. The boiler was a locomotive type with steam pressure of 200 pounds. With six sleds coupled together in tandem, this machine hauled a total of four million board feet on a four-mile haul to the waterpowered mill at Alpena in the winter of 1916-17. The following summer the machine was shipped to Saskatchewan. Although the Lombard was popular in some large logging operations elsewhere, this was probably the only Lombard hauler ever in Nova Scotia. And it was the first successful type with caterpillar treads. The Davison Lumber Company also railed logs over the Halifax and Southwestern Railway (formerly the Nova Scotia Central Railway) from Shannon and Waterloo lakes, and built a number of spurs off the main line between Springfield and Nictaux Falls.

In 1917 a rotary mill was built at Hastings Junction to manufacture hardwood lumber; it included a rotary, a three-saw edger, a trimmer and a wood splitter. The mill was powered by a 150-horsepower boiler and

60-horsepower engine. A spur railway line was built to Mud Lake at the head of Pleasant River and about 11 million board feet of hardwood were extracted and sawn.

The Spanish flu of 1918 did not miss this company's employees and a number died from it, mainly in the woods camps.

At the time of the Armistice, November 11, 1918 some 16 camps were producing logs for the mills at Bridgewater and Hastings. All mills were to be shut down for the winter of 1918-19 except the hardwood mill at Hastings Junction and the box mill at Bridgewater, which continued operating at full capacity. However, in January 1919 the big planing mill at Hastings was operating again and all mills were running at full capacity for the balance of the winter. Lumber was railed to Lunenburg for overseas shipment; the LaHave was frozen as far down as Riverport. One locomotive had been condemned and one was hauling logs from South Brookfield on the Halifax and Southwestern line, while the other engines were hauling from Mud, Shannon, Waterloo and Tomahawk lakes.

Lumber sales were slow again in October 1919 and all mills were closed throughout the winter of 1919-20. Only the pump house at Hastings continued to operate for fire protection and insurance. In May 1921 the mill at Hastings resumed operations to saw the logs in the mill pond and some from other sources. The mill finally ceased operations July 12, 1921 with 34 million feet of lumber in the yard. The last lumber produced by the Davison Lumber Company was still there in August 1922 when Hollingsworth and Whitney bought the assets.

All rails were lifted and shipped to Halifax, loaded on steamers and moved via the Panama Canal to logging operations in British Columbia. The mill machinery was sold, going mostly to New Brunswick and Quebec. Nineteen flat cars went as junk and were dismantled at Hastings. Boilers from Number 3 and 4 Shay locomotives were sold to owners of portable sawmills. The boiler of one locomotive lay on blocks near the company office at the east end of the Bridgewater bridge for some years. Wilbur Sherrard, as master mechanic, blew the last whistle of the Davison Lumber Company at Hastings on July 12, 1921, ending Nova Scotia's largest lumbering operation.

At one time this company owned approximately 325,000 acres of woodland. When it went into bankruptcy in 1921 it had about 200,000 acres. Some of the houses were sold and moved off company property, but most of these and the other buildings were destroyed by fire when the Hastings mill building burned in 1928.

INGRAMPORT MILL

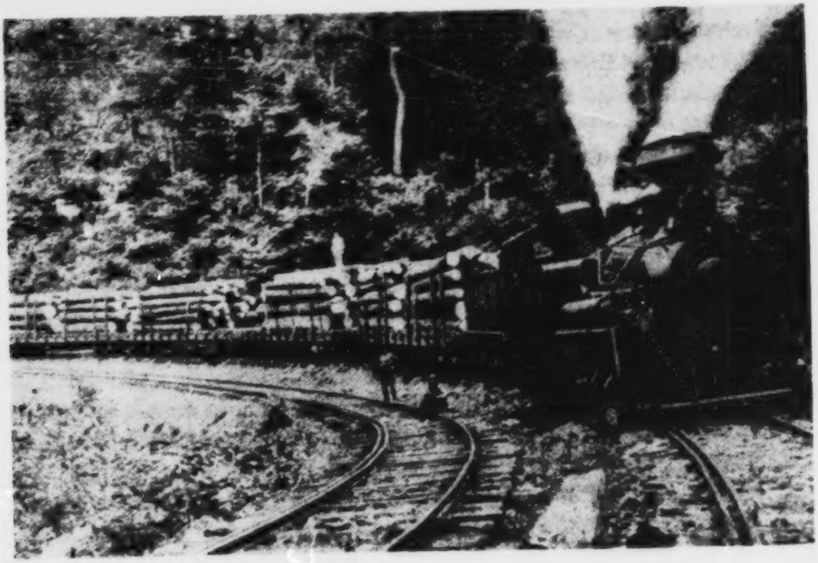
A happier story involves the logging by John Beardsmore and Todd & Polleys from 1865 to 1895. This was confined to the Indian River and Northeast River drainages in Halifax County. Cutting was to a minimum top diameter of 10 inches and only spruce and pine were utilized. Purchased by the Young Brothers about 1895, the mill was moved to Ingramport where they sawed lumber from logs driven down Ingram and Hubbards rivers until 1903, when the plant was bought by Lewis Miller & Sons. The logging by the Young Brothers was generally to minimum top diameters of from 8 to 10 inches, and little or no hemlock or hardwood was extracted.

Before the Millers started sawing there in 1906, extensive alterations were made in the mill and it was enlarged considerably. The enlarged mill had a power plant of four boilers producing a rated 600 horsepower. This mill was unique in having two jack ladders—one bringing small logs for sawing studs (2″ × 3″ and 2″ × 4″) on a twin circular saw, the other bringing larger logs. The best of the large logs were landed onto a log deck which sloped to the right to a log carriage for sawing by a single-cut band saw. Poorer logs were landed on a deck sloping the opposite direction to a 10-blade gang saw for livesawing. There were two gang resaws for sawing cants from the band saw, four circular saws, three edgers, two cut-off saws and two lath machines. Although the mill had a daily capacity of 150,000 board feet, after 1922 it produced only about 100,000 daily or about 20 million feet in eight months of operation per year. The annual production also included more than 30 million laths.

The smaller mill at Jordan Falls, where Harry MacAfee was manager, had a double-cut band saw, a resaw, edger and cut-off saws, producing about 80,000 board feet of lumber per day. Logs for this mill were driven down the Jordan River from the Miller lands, and lumber was shipped by schooner from Jordan Bay and by rail. White pine was the principal product.

After the death of their father about 1910, John L. Miller and his brother A. A. continued their lumber operations until the First World War. They closed the business in 1914 and both went overseas in the Canadian Army; John eventually became a colonel. After the war, the brothers conducted their lumbering again until November 1927. Early in 1928, they agreed to sell all their industrial property to the Royal Securities Corporation for transfer to Mersey Paper Company, except for the very fine timberland draining to the East River which empties into Mahone Bay. This 9,000 acres was sold to Mersey by Colonel Miller's estate in 1948. He died in 1947. The mill was destroyed by fire in 1929, after all the equipment had been removed.

Millers' predecessors at St. Margaret's Bay had each obtained woodland grants and purchased woodlots, gradually consolidating their holdings. The Millers had continued this—in the Mersey and Jordan watersheds as well as in the St. Margaret's region—and by 1927 had acquired some 100,000 acres in Lunenburg, Hants and Halifax counties and over 60,000 acres in Shelburne, Queens and Annapolis counties. Much of the land acquired by the Young Brothers had been owned by Francis Von Ellershausen, who went bankrupt in 1885. In each of the transfers of the sawmill, the purchaser also acquired the woodlands owned by the mill owner.[63]



Hauling logs to the mill at Hastings (1912).

Collection of R. S. Johnson

PULP AND PAPER

The revised lease legislation did not affect the Big Lease in Victoria and Inverness counties. That was in a class by itself. Under Barnjum's management, small operations were conducted in the North River area in Victoria County from 1902 to 1907. A small mill for slashing and rossing was built at Murray and there were five camps in the woods, producing a total of probably 15,000 cords of choice pulpwood in that period. These operations proved to be unprofitable and they were discontinued; the mill was abandoned and it later burned.[51,60] According to Gordon Harvey, manager of the Cape Breton Division of Oxford Paper Company from 1917 to 1931, Barnjum was still managing the Big Lease when a new rossing mill and a shipping pier were built at Murray in 1915-16, at an approximate cost of $125,000. Designed for hand rossers, it had a capacity of 80 cords per 10-hour day. In January 1917, the lease, mill and other properties were taken over by the Cape Breton Pulp and Paper Company Limited, affiliated with the Oxford Company. This was all absorbed by Oxford in April 1920.[60]

From 1917 to 1931 inclusive, the watersheds of four branches of North River were developed. Thirty-one woods camps were built and operated, with substantial tote roads and telephone lines, from Murray to all camps and to St. Ann's and Englishtown. For log driving, extensive river improvements, including 18 dams, were made. At Murray a boarding house and a number of dwellings and other buildings were erected, including a 400-foot warehouse on the wharf. In 1917 the debarking mill was remodeled by installing a barking drum with a capacity of 250 cords per 10-hour day. Extensive conveyor systems were built for bark disposal, wood storage and for loading wood on ships. Booms and piers were placed in the North River holding area; these were made more substantial in 1920.

In the 13 years (1919-1931) of the Oxford Paper Company's operations in Cape Breton, a total of 324,904 cords of spruce and fir pulpwood was cut from 35,884 acres—an average production of 24,993 cords per year and an average cut of 9.05 cords per acre. Of the total wood produced, 62,349 cords were sap-peeled in the years 1925 to 1931 and loaded on ships from the water. The other wood was debarked in the drum barker and loaded from the water by mechanical conveyors. The wood was cut in two-foot blocks until 1929, and in four-foot lengths thereafter.[60]

During this period the average number of men employed annually varied from 84 to 885 in the woods and 39 to 136 at the debarking and loading plant. A total of $3,639,146.90 was paid in wages, with an additional $50,000 paid for labour in building the main boom in 1920. Some $15,000 was also paid yearly to salaried employees stationed in Cape Breton. Cooks and foremen in the Oxford Paper Company operations of 1921 were paid $100 per month; and woods labour got $55 per month. Those cutting by the cord were paid 75 cents per cord.[60]

COMPETITION

The pulp and paper industry in Nova Scotia, comparatively new as it was, suffered directly from the effects of the economic and political extremes of the times. New technology helped profitability by increasing output and quality, but poor business acumen and the vagaries of war and the depression compounded the difficulties of this somewhat risky and very competitive sector of the eastern North American economy.

After the Acadian Pulp and Paper Mills Company Limited near Milton, Queens County failed in 1903, John S. Hughes secured a lease of the two pulp mills with an option to purchase. He secured enough capital to build a cardboard mill at Rapid Falls, and struggled for four years with insufficient working capital. Then his lease expired and he was left with only the cardboard mill.

Sensing opportunity, John R. MacLeod of Halifax bought the properties in 1907 and formed the MacLeod Pulp Company Limited, of which MacLeod, Frank Stanfield and Becker & Company of England were the principal promoters. Shortly afterward Becker & Company was replaced by F. B. McCurdy of Halifax. More grinders were installed, increasing the daily capacity to 50 tons. Other improvements were made and the cardboard mill became quite profitable. The price of pulp continued to be very low, but this company enjoyed practically all of the Maritime cardboard business, producing most grades.

At this time construction in the Canadian West was booming and demand for sheathing paper was heavy. Wholesale firms had their own brand names and supplied a label for each roll. This sheathing paper was made from pure wood pulp—although one company's label read "Asbestos Sheathing: Practically Fireproof." Carritte-Patterson, large manufacturers of roofing, bought a lot of this cheap sheathing paper, dipped it in hot tar and it became "tarred felt."[40] Coloured cardboard, used by such firms as Moirs Limited of Halifax, was the most expensive for the buyer and the most profitable for the MacLeod Company. During the First World War, dyes became very expensive and some colours were unavailable. The English cardboard market grew rapidly and MacLeod, finding this more profitable, discontinued the sheathing business. He also had a large business in ticket board, enjoying exclusive contracts with a number of English cities.

In 1912 this company decided to increase its groundwood capacity, and to build a larger cardboard mill and a small newsprint mill at either Cowie's Falls or Brooklyn, where the Bowater paper mill is now located. Extensive surveys of the Mersey River were made and four power developments on the river below Lake Rossignol were planned. The demand for newsprint paper was increasing rapidly. By 1913 it became so great that the United States removed its tariff on this product. The outbreak of war in 1914, however, held back construction of new paper mills in Canada, and when the MacLeod cardboard mill was destroyed by fire in 1915 it was not rebuilt. The South American market for pulp then became the most profitable and most of MacLeod's production was shipped there, offsetting the loss of the burned mill. Later, their entire production was sold in the United States, most of it to the Tidewater Paper Company of Brooklyn which manufactured newsprint for the *New York Times*.

In 1919, F. J. D. Barnjum, largely financed by F. S. Mosely & Company of Boston, bought the mills and the woodlands owned by MacLeod and brought into the company an additional 210,000 acres of woodland. This included 175,000 acres granted to the Nova Scotia Central Railway.[40] Much of this railway land had been burnt in the early 1900s in fires started by the Springfield Railway of Davison Lumber Company. When the MacLeod Pulp Company was acquired by Barnjum and his associates the name was changed to MacLeod Pulp and Paper Company Limited with Barnjum as president, S. H. Fessenden of Boston as secretary treasurer, and J. R. Gordon as manager. I. W. Freeman was the Rapid Falls mill superintendent and A. C. Hatt the Cowie's mill superintendent.[40]

In 1920 Hatt left his position with this company. In January of 1928 Freeman was drowned when he went over the Rapid Falls dam on an ice pan. Gordon resigned as manager in 1926 and was replaced by J. A. Parker. At this time the Rapid Falls mill had nine three-pocket grinders and the company's annual production was 12,000 tons of air-dry news grade pulp. During the war the price of groundwood pulp had soared, and early in 1919 it was $100 per ton. Then, as rapidly as it had risen, the price fell. Over the next few years profits steadily declined, until the mills were operating at a loss. Barnjum decided to build a newsprint mill and gave the project a great deal of publicity.

Elected a member of the Legislative Assembly in the provincial election of 1925, he promised to resign if he did not have the paper mill built. It was not built and he resigned.

Barnjum retired around 1926 and Neal Rantoul of the Boston office of F. S. Mosely & Company became President of MacLeod Pulp and Paper Company Limited. The MacLeod mills were closed in September 1928 and the Nova Scotia Power Commission closed the gates of the new power dam at Lake Rossignol in October. This and two other dams were built on the Mersey River for the new Mersey Paper mill then being built at Brooklyn, Queens County.

In August 1929 Mersey Hydraulic Company Limited, a subsidiary of MacLeod Pulp and Paper Company Limited, was expropriated by the province.[64] This subsidiary owned the old dam at the foot of Lake Rossignol and 24 parcels of land affected by Rossignol flowage. All the assets of this subsidiary and all plans and reports of the Yorston Survey of the river and lakes made in 1913 were taken and Mersey Hydraulic was wound up.

In the early 1930s, MacLeod sold some 60,000 acres, most of which had been burnt between 1905 and 1910. The majority was sold to the province, although some of the better land went to private individuals. The MacLeod Company and its subsidiary, Annapolis Lumber Company, agreed in 1936 to sell all the remaining woodlands to Mersey Paper Company. These lands comprised approximately 176,000 acres in Annapolis, Kings, Queens and Lunenburg counties. The sale was completed in 1944 and MacLeod and Annapolis Lumber Company were wound up shortly afterwards.

Another story of opportunism involves G. D. Campbell & Company of Weymouth and the rebuilding of the Sissiboo Falls mill which had been destroyed by fire in 1911. Although destruction of the buildings was nearly total, there was no damage to dams, penstocks or machinery, and reconstruction cost only $12,000. With the refurbished mill operating under Campbell, baled pulp was moved by scows at high tide to Weymouth where it was loaded on ships. This could not be done in freezing weather, however.

At the outbreak of war in 1914, most of the men of the Campbell family enlisted in Canada's armed forces and G. D. Campbell had difficulty in managing the lumber and pulp business. Sir Frederick Becker of London, England then invested in this Sissiboo Pulp and Paper Company, which lost money when the price of pulp fell in 1919. Through a liquidation sale, Becker acquired the company and changed its name to Becker & Company. He had three new grinders installed and made other extensive improvements. He also had a railway spur built from the pulp mill to the Dominion Atlantic Railway, about 1 3/4 miles in length. After this spur was built, baled pulp was railed to Digby where it was loaded on steamers.

Under Becker's ownership, the name was later changed to the Sissiboo-Clyde Pulp and Paper Company Ltd. under the control of I. H. Mathers Limited of Halifax. Arthur C. Hatt, who had been superintendent of the MacLeod pulp mill at Cowie's Falls, became superintendent of this Sissiboo mill. The mill averaged 40 tons of pulp per day, although production in 1922 was only 6,000 tons.[56]

At that time, the Sissiboo-Clyde Pulp and Paper Company had 22,536 acres of freehold woodland and 6,425 acres of Crown leases on tributaries of the Sissiboo River. H. E. Wagner was woodlands manager and later general manager under I. H. Mathers Limited.[56] The groundwood pulp mill—two miles upstream from the Village of Clyde River, Shelburne County—was built by Rod McColl of Halifax in 1909. It operated for three years and was purchased by Sir Frederick Becker who then had it rebuilt. New machinery was installed and the output was increased to 20 tons per day but, as with the other waterpowered mills, there were always shutdowns in dry periods.

Starting in 1920, John W. Hatt, a younger brother of Arthur Hatt, superintendent of the mill at Weymouth Falls, was superintendent of the Clyde River mill. Stillman Jones of Weymouth followed him as the last manager of this mill. Besides 38,511 acres of Crown lease Becker held in the Clyde River drainage basin, he claimed over 9,000 acres of freehold land. More than half was in "location lands" and the title to most of these lands was defective.[65] Most of the pulpwood—nearly all of it black spruce—was cut on the Crown leases and river-driven to the mill in eight-foot lengths. Before debarking, it was slashed into two-foot bolts at the mill. With three grinders, the daily capacity was 15 tons.[56] The baled pulp was trucked from the mill four miles to the Halifax and Southwestern Railway shed at Port Clyde. Prior to Becker's ownership of the mill at Weymouth Falls, the pulp from the Clyde mill was railed to Shelburne where it was stored and then loaded on steamers. After this, the pulp from both mills was delivered at Digby by railway and loaded on steamers there.

Sometime before the mills closed down in 1928, control of the Sissiboo-Clyde Pulp and Paper Company Limited was transferred from Becker & Company to Edward Lloyd Limited of England. In 1929 the Sissiboo-Clyde Pulp and Paper Company Limited was sold to Mersey Paper Company. Within several years, the Crown leases expired and, in 1950, Mersey Paper Company deeded the location lands with defective title to the province for $1.00.[65] The Clyde River mill was sold to John and Hallet Nichol of Clyde River, who converted it into a sawmill.

In 1919 R. A. Jodrey, W. H. Chase and Charles Wright of Wolfville founded the Avon River Power Company and had a high concrete dam and a power house built at White Rock on the Gasperaux River. They also had a small one-grinder pulp mill built near the powerhouse. Hauled to Port Williams by teams and later by trucks, the pulp was loaded on steamers for export to the United States. Thomas Hughes, the youngest of the three brothers who had come from England with their father to build Ellershausen's pulp mill at St. Croix in 1875, was the first manager of this White Rock mill. The Avon River Power Company continued operating with a surplus of generating capacity and, in 1927, Jodrey, Wright and T. B. Akin incorporated the Minas Basin Pulp and Power Company Limited. This company's mill at Hantsport produced its first groundwood pulp in February 1929. It was soon manufacturing 30 to 40 air-dry tons per day. The pulp was sold to Scott Paper Company at $35 per ton at Chester, Pennsylvania. Pulpwood was being bought then for $4.00 to $5.00 per cord.[66]

Shortly after the Hantsport mill started operations, Jodrey and Wright sold the Avon River Power Company to the Nova Scotia Light & Power Company. The chief interest of the Light and Power Company was the Halifax market, and the Minas Basin Company got only the surplus power. This dwindled as water levels fell in the rivers in dry periods. Through considerable effort and fortunate political connections, Jodrey acquired a dam site and water rights and had a new and larger dam built on the St. Croix River. The Minas Basin Company bought W. H. Chase's St. Croix lands of some 40,000 acres in 1932.[66]

In the early thirties groundwood pulp prices fell to less than $14 per ton and unskilled workers' wages to 14 cents per hour. The Minas Basin pulp mill made small profits in these depression years. But as pulp prices improved, this mill's production rose from 5,000 air-dry tons in 1929 to 14,000 in 1938, and overall mill capacity reached 20,000 tons per year.[79] This company had a second dam built on the St. Croix River in the late thirties. The two dams could produce 40 million kilowatt hours annually at low cost. In 1938 Minas Basin Pulp and Power Company Limited owned 117,000 acres of woodland and, with Canadian Keyes Fibre, owned buildings, equipment and land worth $1,727,460.[66]

Through the war of 1939-1945, the Minas Basin company controlled lumber producers who were Nova Scotia's leading lumber exporters. In 1947-48, the company and its subsidiaries shipped nearly 40 million board feet of lumber to Europe. In 1946 the Minas Basin company started building a new board mill. By 1970, more than 1,100 people worked for Minas Basin Pulp and Power Company and its associate, Canadian Keyes Fibre. By the mid-seventies it produced nearly 30,000 tons of paperboard per year.[66] R. A. Jodrey died in 1973 and his son, J. J. Jodrey, became president.

Starting about 1914, methods of pulp and paper manufacture improved greatly in North America. In most mills antiquated machinery was replaced by larger and more efficient installations, and workers were given more training. The demand for wood pulp for explosives during the War of 1914-18 and the increasing demand for newsprint put the price of the latter up to $80 per ton. This demand, along with that for other pulp and paper products, fell after the war and by 1920 the price of newsprint was down to $63 a ton.

Pulp and paper mill workers' unions strengthened during the First World War and their economic and social conditions improved. Sawmill and woodsworkers, however, were not organized and their standard of living continued at a comparatively low level. As in previous European wars, Great Britain was cut off from her Baltic lumber supplies and eastern Canadian softwood lumber again became a necessity. Because of the buoyancy of this wood, some of the torpedoed ships carrying lumber did not sink and their cargoes were delivered. Even sailing vessels were put into service freighting lumber and these were hardly worth a torpedo. Lumber prices soared to as much as $60 per thousand board feet and production in Nova Scotia jumped to the full capacity of the limited manpower and the available equipment.

At the end of World War I, Britain turned again to the Baltic countries for most of her softwood requirements. Indeed, until the 1960s Britain's preference strongly favoured the Baltic lumber because it was more suitable and was cut to the specifications that the British wanted. Until recent years, Canadian lumbermen often had the attitude that the British should take what they could get; to their dismay, Britain did just that after the war.

FOREIGN OWNERSHIP

In New England, where most of the American paper mills were situated at that time, the spruce-fir forests were rapidly being depleted. Anticipating a shortage of wood supply, manufacturers turned to Canada to augment the supply from their own forests. By 1920, practically all Canadian provinces were prohibiting export of unmanufactured pulpwood from Crown lands and most of them had little spruce-fir freehold land.

A number of the American paper companies with mills near the Atlantic coast became interested in Nova Scotia, which had more than 10 million acres of freehold woodland, much of it bearing exportable pulpwood. Some companies were content to merely buy wood free on board ships from contractors, while others purchased considerable forest acreages to be certain this source of supply would be continuous.

In 1919 lumber prices dropped more than did pulp and paper prices and many producers went bankrupt. Stock which had cost so much to produce brought half the return. Many logging operations ended abruptly and in some cases even cut logs were left to rot in the woods.

Following this bad break in the market, large holdings of woodlands were available at low prices. One of the first companies to take advantage of the situation was Hollingsworth & Whitney Company of Boston, Massachusetts. A subsidiary, Hollingsworth & Whitney Limited (H. & W.), was incorporated in April 1922 and in May this new company purchased 198,452 acres in Annapolis, Kings, Queens and Lunenburg counties, formerly property of the Davison Lumber Company. Also purchased that month were 35,903 acres from C. T. White & Sons Limited in Cumberland County.[67]

Early in 1923 H. & W. acquired a one-third undivided interest in the Cape Chignecto lands (comprising 18,000 acres), and all of the 38,198 acres of Robinson-Wright & Company Limited in Cumberland County. In August 1924 H. & W. also purchased the 247,815 acres that Archibald Fraser, of the Fraser Pulp & Lumber Company Limited of Plaster Rock, New Brunswick, had bought after Alfred Dickie's company went bankrupt.[67] Fraser supposedly cleared over a million dollars in this transaction. Included in these land purchases was a considerable acreage of Crown leases, from which it was illegal to export pulpwood. These leases all expired by the end of 1946.

Other than the increased pulpwood export and the establishment of the Albany Perforated Wrapping Paper Company (A.P.W.) pulp mill, the rapidly increasing demand for newsprint paper had little effect on Nova Scotia before 1928. However, as this demand increased, many United States companies were forced to build mills in Canada. In 1926 Canadian newsprint production surpassed that of the United States; in fact, Canadian production increased from 800,000 tons in 1920 to 4,000,000 tons in 1930.

In 1923, the A.P.W. of Albany, New York purchased the Rhodes-Curry woodlands in the Sheet Harbour River drainage area.[51] This property comprised 65,000 acres of freehold and 40,000 acres of Crown leases, plus buildings and a wharf at Sheet Harbour. Construction of a groundwood pulp mill at the wharf location was started that year and the Nova Scotia Power Commission installed two hydropower units, to yield 2,500 K.V.A. each, at Ruth Falls on East River, Sheet Harbour. The first merchantable pulp was produced, and the first cargo of 1,100 tons was shipped to the A.P.W. paper mills in Albany in 1925. This mill operated under A.P.W. with F. A. Gaylord as manager until sold to the Roger Babson interests in 1933. Sold again to the Fox-Duquet interests in 1944, the company name was changed to Halifax Power and Pulp Company Limited (H.P. & P.), a name it retained through the rest of its existence. In 1946 the Hearst Corporation of New York City bought the company and also purchased the American Realty Company woodlands of 45,000 acres at the head of Sheet Harbour River from International Paper. At that time this contained some of the best spruce in eastern America.

Fraser Companies Limited of Plaster Rock, New Brunswick purchased H.P. & P. from the Hearst Corporation in 1955 and sold it to Scott Paper Company in 1964. On August 15, 1971 the mill was destroyed by a flood when 10 inches of rain fell in 36 hours at Sheet Harbour. That ended pulp manufacture there. The annual pulp production from this mill was approximately 22,800 tons and, after the A.P.W. days, it was all shipped to Scott Paper Company at Chester, Pennsylvania.

The Polaris Shipping Company, founded by a small group of escaped White Russians in 1920, was acquired by the West Virginia Pulp and Paper Company in 1924 and the name was changed to Sonora Timber Company. The head office was at Sonora, Guysborough County and there was another office at Guysborough, managed by B. L. Parker. A considerable acreage of woodland was purchased in 1924 and 1925, mostly in small lots of 100 to 1,000 acres, situated mainly in the St. Mary's River and Salmon River watersheds. Debarking plants with fiddlehead rossers were built at Sonora near the outlet of the St. Mary's River and at the Salmon River estuary near the village of Guysborough. A considerable cordage of pulpwood was driven down these rivers, debarked at the rossing plants and shipped to Newport News. Wood was purchased from farmers and contractors besides what was cut on company lands.

The Sonora Timber Company continued operations until about 1933 when it was closed down. About that time Captain Agapayeff, who had continued as president, committed suicide at the Halifax Hotel. Rizanoff, who had been treasurer for Polaris and Sonora, moved to Quebec where he continued to be active in the pulpwood industry. Some of the other Russians married locally and continued to reside in Guysborough County.

The Scott Paper Company of Chester, Pennsylvania considered establishing a large pulp mill near Liverpool and started investigations in 1926. Owning no land in Nova Scotia at that time, Scott bought the Nova Scotia Wood Pulp and Paper Company Limited (N.S.W.P. & P. Co. Ltd.) at Charleston in 1927. The power commission made extensive surveys of the power potential of the Medway River for this proposed project until 1928, when negotiations were discontinued.[54]

Of the United States companies that had lands cruised or bought in Nova Scotia in the 1920s and the S. D. Warren Company, which bought the Dickie & McGrath Tusket lands in 1913, only the International and Scott companies considered building pulp or paper mills in Nova Scotia.

Hollingsworth & Whitney exported a considerable volume of pulpwood which was driven down the LaHave River and loaded on ships. They had a rossing and chipping plant built at Bridgewater in 1922. Most of the wood was debarked and some was chipped. This practice ended about 1927 when the Town of Bridgewater started taxing the wood held in the river within town limits. H. & W. also exported wood from their holdings in other parts of the province by rail. All operations were geared exclusively toward supporting the wood supply for the Hollingsworth & Whitney pulp mill at Winslow, Maine. A considerable amount of sawlog stumpage was sold to local sawmills but this company had no mill of its own in Nova Scotia except the rossing and chipping mills at Bridgewater.[68]

Other parties exported pulpwood from Nova Scotia in this period besides those already discussed. In 1927 the provincial chief forester, Otto Schierbeck, stated that over 2,000,000 acres of the best freehold timberland in Nova Scotia was in the hands of American pulp and paper companies.[69] This large foreign ownership of woodlands, with the comparatively large cordage of pulpwood being exported solely for manufacture of pulp and paper outside the province, was of great concern to many Nova Scotians.

According to Dr. B. E. Fernow's report of 1912, no pulpwood was exported from this province in 1910 and it was reported that only 3,310 cords were exported in 1915.[70] By 1920 this export had increased to 56,134 cords and by 1925 to 124,455 cords. The maximum movement of pulpwood out of Nova Scotia prior to the depression of the 1930s was in 1928 when 194,673 cords were shipped, according to Department of Lands and Forests reports.[69] Most of this went to the United States but some was shipped to Europe.

Exhibiting interest in the appearance of easily available resources in Nova Scotia, the West Virginia Pulp and Paper Company, now Wesvaco, had the woodlands of Lewis Miller & Sons Limited at St. Margaret's Bay and Lake Rossignol cruised by James D. Lacey & Company of New York City in 1923. These properties contained a large percentage of hemlock and not sufficient spruce and fir for the West Virginia Company and so they were rejected.

In 1926 the International Paper Company had the MacLeod Pulp and Paper Company and the Lewis Miller & Sons woodlands cruised under the supervision of Raymond L. Whitney of Maine. It was decided that there was insufficient spruce and fir on these lands to support a 250-ton per day newsprint mill and International transferred its interest to Dalhousie, New Brunswick where it had a paper mill built.

Availing itself, too, of the plentiful supply of wood was the S. D. Warren Company of Portland, Maine, which, through its Nova Scotia subsidiary, the Nova Scotia Timberlands Company, started shipping wood from Wedgeport at the mouth of the Tusket River around 1924, when Ralph P. Bell of Halifax became manager of the latter company. Bell set up an elaborate boundary survey and timber cruising system under the supervision of Peter G. Boutilier, a provincial land surveyor who was later mayor of Yarmouth for some years. Trees were tallied by species and diameter classes, with some height measurements, on continuous half-chain (33-foot) strips at five-chain intervals throughout the 50,000-acre properties owned by Dickie & McGrath before 1913.[50] In 1924 Bell had one of the first logging access truck roads in the province built. It ran from the public road at North Kemptville up the Tusket Valley to New France, a distance of 18 miles. He also had three galvanized steel fire towers erected and telephone lines connecting these and three logging camps with the head office. He purchased motor driven forest fire pumps, hose and accessories.

The cordage of pulpwood shipped to the parent company at Portland, Maine is not known but the elaborate surveys, construction and equipment were too expensive. Mr. Bell was relieved of his responsibility in 1926 and his accountant was appointed manager of Nova Scotia Timberlands Limited. Within a few years the pulpwood exportation from these properties was discontinued and the company tried sawing lumber with a portable mill at Barrios Lake. Having little or no experience at woods work, the new manager made impractical demands of the woodsmen and this, with the economic crash of 1929, brought all operations to an end. Two of the fire towers were abandoned and the third one at East Kemptville was acquired by the Department of Lands and Forests. It is still used during fire seasons.

MERSEY

Sometimes a succession of events of major significance have their genesis in the mind of one man. When Ralph P. Bell left Nova Scotia Timberlands Limited in 1926 he returned to his home in Halifax. There he started working on the proposition of building a newsprint paper mill of a daily capacity of 50 tons. He had been impressed by F. J. D. Barnjum's idea of such a mill on the Mersey River, but the proposition was much too large for Bell's resources. However, he captured the interest of the powerful Montreal financier I. W. Killam, President of the Royal Securities Corporation, and Killam had a paper mill built.

Supporting the proposal of such a mill based on the hydropower potential of the Mersey River were Killam's business associates J. McG. Stewart (a prominent Halifax corporation lawyer) and J. C. MacKeen of the Halifax office of Royal Securities. In the summer and fall of 1926 Killam had the Mersey River power possibilities examined, along with the pulpwood resources of the MacLeod Pulp and Paper Company and of the Lewis Miller Company. There was close co-operation between Bell and Killam during these investigations but after that Bell appears to have had no part in the establishment of the new Mersey Paper Company.[71]

In the spring of 1927 Killam was told by one of the foresters who cruised the Miller lands that these lands could not yield 100,000 cords of spruce and fir annually in perpetuity and Killam decided then not to have the mill built. However, early in 1928, arrangements were made with the provincial government for an agreement to ensure that a million cords of pulpwood be made available from Crown lands in Guysborough County and Cape Breton.[71] With this assurance Killam decided to go ahead.

Mersey Paper Company Limited was incorporated July 31, 1928 with only Stewart, MacKeen and Frank M. Covert, a young lawyer with Stewart's firm, as the incorporators. Killam's name was not included but the company was under his control. Before that date Col. C. H. L. Jones, formerly with the Spanish River Pulp and Paper Company at Sault Ste. Marie, Ontario, had been appointed as president of the new company and there was a small staff at work in an office in the Roy Building in Halifax.

As the power dams were being built on the Mersey River for the Power Commission in 1928 and 1929, the Mersey Paper Company mill was being constructed at Brooklyn, Queens County on Liverpool Harbour. It was to have a rated capacity of 300 tons per day. The mill started producing newsprint paper November 27, 1929.[72] From the viewpoint of markets and profits, this could not have happened at a worse time. The tragic New York stock market crash occurred on October 30, 1929, starting the worst worldwide economic depression in history. Heavily dependent on exports, Canada's markets quickly shrank. Added to this country's woes was the drought in the prairies in 1929 which reduced the wheat crop to less than 60 per cent of the yield of 1928. The "Dirty Thirties" or "Hungry Thirties" were inevitable. Unemployment and deprivation escalated nearly everywhere.

According to the *Financial Post* in 1931, the price trend in Canadian pulp and paper stocks rose from $100 in 1926 to $160 in 1928 and then fell to less than $20 in 1931; the average of all industrial stocks rose from $140 in 1926 to $300 in 1929 and then fell to less than $100 in 1930. The *Post* also stated at that time that Mersey Paper Company earned sufficient in its first full year of operation to cover depreciation, pay the interest on bonds and loans and have a surplus of $172,701. Mersey's first year's output was sold in New York at $53.20 per ton. By 1934, Mersey's price had fallen to $40 per ton of newsprint paper and then it gradually increased to $50 per ton in 1938 in U.S. currency.

Times were most difficult through the depression of the thirties and Mersey fell into heavy indebtedness. However, it was one of the few paper companies of North America that did not go into receivership. One bright spot in this gloomy picture for Canadian exporters, including Mersey, was the decrease in the value of the Canadian dollar to 80 cents in U.S. funds. Salaries and wages of all Mersey employees were cut by 10 per cent, but this was cushioned a bit by a drop in retail prices at the stores.

Mersey had its own paper-carrying ship, the S.S. *Markland*, built in England in 1929. With a capacity of 4,300 tons, she was designed specially for carrying rolls of newsprint. Starting early in 1930 she regularly made two round-trip voyages between Liverpool, Nova Scotia and New York each month.

The Mersey mill was designed with two paper machines, each 225 inches wide, for a daily (24 hour) total capacity of 250 tons. This would provide an annual capacity of more than 60,000 tons and require nearly 100,000 cords of pulpwood plus 50,000 tons of coal, 3,500 tons of limestone and 2,500 tons of sulphur.[72]

Mersey acquired an area encompassing a limestone occurrence at East River, Lunenburg County and quarried its own limestone for use in the sulphite process. Practically everything used in making the paper was produced in Nova Scotia except the sulphur, alum and dyes. The pulpwood used was spruce and fir—75 per cent for groundwood and 25 per cent hemlock for sulphite pulp. Mersey was one of the first companies to use hemlock in the manufacture of newsprint paper. The hemlock, all cut on company lands, was sap-peeled as the trees were cut, between the first full moon in May and the last full moon in August. The peeling was done so that the hemlock would float. (Other softwoods float without peeling.) The peeled hemlock was hauled in winter along with the unpeeled spruce and fir, and stream-driven the next spring. The hauling was mostly by oxen although some horses were used. Hemlock over 18 inches in diameter was split by an efficient steam-powered splitter at the top of the conveyor carrying the four-foot bolts into the wood room at the paper mill.

The Crown land agreement between the province and Mersey was to make one million cords of spruce and fir available over a period of 30 years. Cutting licenses were to be issued to Mersey for lands in Guysborough County and Cape Breton and the company was to select the land required. Under the terms of the agreement, the stumpage rate for the first 10 years was set at $1.00 per cord, increasing to $1.50 per cord for a second 10-year period, and $2.00 per cord for a third period of 10 years. In 1980 dollars, these rates would be about $5.10 for the first 10 years, $9.90 for the second 10, and $9.20 for the last 10 years. Furthermore, Mersey Paper Company was required to pay a provincial land tax of one cent per acre of the licensed Crown land annually, and the municipal taxes. The total annual tax per acre of licensed Crown land averaged 9.375 cents.

Mersey was provided with prints of the old Crown land maps—with all their errors—for examination and selection of the available Crown lands. Excluded from the agreement were all areas of Crown lands held under uncompleted grants, squatters' rights and those covered by previous applications. These were numerous but few of them were shown on the maps. The province's title to much of the so-called Crown land was defective. The agreement required the company to survey the boundaries of the Crown lands to be licensed but there was no mention of titles. Mersey had to do the title searching as well at considerable cost.

To make a long story short, Mersey would have saved millions of dollars had there been no million-cord agreement; but for financing purposes it was required as assurance of adequate pulpwood reserves.

Mersey Paper Company newsprint mill (1929).

Courtesy of Bowater Mersey Paper Company

CHAPTER 28

GETTING THE WOOD PRODUCTS OUT

THE PEOPLE

One of the large lumber companies of the early 1900s in Nova Scotia was Lewis Miller & Sons Company Limited. This company had a large steam mill at Ingramport, Halifax County and a smaller one at Jordan Falls, Shelburne County and was, in many ways, typical of many firms operating in Nova Scotia at this time. The Millers' Ingramport mill was originally built at the Head of St. Margaret's Bay about 1865 by John Beardsmore.

Lewis Miller lumbered in Scotland, Sweden, and Newfoundland and his sons, John L. and A. A., joined the firm before coming to Nova Scotia in 1903.[63] In the move from Sweden to Newfoundland, a number of Swedish employees and their families went with the Millers and later followed them to Ingramport. John L. Miller, the older of the two sons, was born at Crief, Perthshire, Scotland in 1876.

The Millers had had two steam sawmills in Newfoundland: the larger one at Millertown near the north end of Red Indian Lake, and the other at Glenwood at the outlet of Gander Lake. The lumber from these mills was moved by rail to Lewisporte on Notre Dame Bay and shipped overseas from there. Today, there is very little white pine in Newfoundland but the Millers' production there was almost entirely white pine. The Millers were good patriotic citizens but hard employers. Regardless, many of their men were loyal and appreciated employment with the Millers, as indicated by the Swedes who left home to go with them to Newfoundland and who followed them to Nova Scotia.

Logging and stream driving were done by the Millers as was customary in most of Nova Scotia in the period 1906-1927; only horses were used for hauling, however. The Miller Company's tote roads were rough and rocky but they had a ground telephone line to each logging camp. Except for large spruce logs, which before 1914 were team-hauled over the height of land from the St. Croix River areas, logging was confined to the Ingram River watershed. In 1922 the Nova Scotia Power Commission expropriated lands fronting the larger lakes draining into Indian River. The proposed flowage areas were logged by contractors, and the logs river-driven to the Head of St. Margaret's Bay, were delivered to the mill at Ingramport by being towed across the bay in booms.

The Miller Company had an "alligator" for towing booms of logs, probably the only boat of its kind ever seen in Nova Scotia. It was built for exceptional strength and it could run, or pull itself, over stumps and rocks in the water at low speed with no damage. By means of a steam winch and 4,000 feet of half-inch steel cable it could also haul itself overland under its own power on rough rocky roads. The alligator had 150 horsepower on its winch drums and 12 horsepower on each of its two propellors. When in full use, it burnt an average of a half cord of hardwood per day. This craft was 40 feet long with a beam of 10 feet and a draft of 3 feet.[63] Headworks were also used for moving logs on some lakes.

There was no piecework in the Miller logging operations. All employees were paid by the month—except on river drives, when the men got paid every day. In the 1922-23 season, 200 men were employed in the woods on the Ingram River area and, in 1923, 120 men at the Ingramport Mill. Working hours for logging were from daylight to dark with time out for lunch. On the drive, men put in from 8 to 18 hours a day. In 1923 a foreman was paid $80 per month, cooks $75, scalers $60, and choppers $30. On the river drives foremen, cooks and cookees were paid the same, but drivers received from $1.25 to $2.25 a day.[63]

RAILWAYS

From the late 1800s to the early 1920s a number of lumbermen made tramways of wooden rails to haul out logs that had been left in the woods in a poor sledding winter; there were a number of such winters. These tramways were generally only a mile or two in length and hauling was done by horses or oxen in the spring or early summer.

The original Liverpool & Milton Railway was built in 1896 along the middle of the public road between Liverpool and Milton, west of the Mersey River, and extended down Main Street in Liverpool before turning off to the wharf. In 1906 the Halifax & Southwestern Railway along the south shore between Halifax and Yarmouth was completed and its owners, McKenzie and Mann, acquired the Liverpool & Milton Railway.[40] Soon after that, this railway was rebuilt with the roadbed located between the river and the public road. It continued carrying freight, mostly pulp, between Rapid Falls above Milton and Liverpool until 1932 when the last train ran on this short line. The railway was a tremendous asset for the Nova Scotia Power Commission in moving heavy equipment when the power stations and dams were being built on the Mersey River in 1928. The rails were removed in 1936.[40]

The branch railway line between New Germany and Caledonia, Queens County was built in 1903. Today it no longer carries passengers but is still important to the North Queens County community in moving freight.

The Sable Lumber Company railway was narrow gauge, using secondhand 56-lb. rail, purchased from dealers in Saint John, New Brunswick. There were enough small flat cars with link-and-pin couplings in the company to carry supplies, equipment, teams and personnel to the camps and portable mills and to return to Wilkins Siding with sawn lumber. The locomotives consisted of two Baldwin saddle tankers, two Shays and a quaint Belgian-built locomotive.

The Sable Lumber Company and its employees were careful about fire. Homemade spark arresters were used on the locomotives, which burnt hardwood, and when the fire hazard was high the locomotives did not operate. A few fires were started but, being near the railway and because the woods were not too dry, these were extinguished while still small. Slabs were burnt in the open in wet weather at the mill sites.

Frank Martin of Milton was the professional hunter for the Sable Lumber Company and he kept the camps supplied with moose meat most of the time. This was of course illegal, although most lumbermen did serve moose and caribou in their camps, when and where available, in the 1800s and early 1900s.

The Davison Lumber Company and the Sable Lumber Company were the only ones known to successfully use railways in extracting logs and lumber from areas otherwise economically inaccessible in Nova Scotia in the early 1900s. The Sable Company was incorporated in Maine in 1907, with John H. Walker of New Market, New Hampshire as president. He was soon replaced by Rufus Webb of Brunswick, Maine. W. L. Hall of Liverpool was the first Nova Scotia agent of this company and he was later succeeded by Ralph W. Hendry, also of Liverpool. In 1911, the company was reorganized and reincorporated in Massachusetts with its head office in Boston; C. J. Prescott was president.

Altogether, there were over 20 miles of main railway lines in use, but never that much at one time. Several portable rotary mills were operating, some located on the main lines and some reached by spur lines averaging about two miles in length. Each spur was used until the timber within its reach had been cut and sawn and the lumber landed at Wilkins Siding. Then the rails and ties were lifted and moved to the next spur location for the next mill site farther on. Each mill produced an average of a million feet per year.

There was excellent white pine, spruce and hemlock in this part of the country in forests intermingled with extensive bogs. In numerous places, the railway was laid over bogs with piers built to support the ties and rails in soft places. In some places the railway settled. When this occurred, the rails and ties were lifted, the piers extended upward and the ties and rails replaced on top. One branch of the railway extended to First Broad River Lake and the other to Conway Brook, within 1 1/2 miles of what is now Lake Rossignol. This branch crossed part of Dunraven Bog.

Logging and milling ceased in December 1917 and by May 1919 the company held no property in Nova Scotia except its timberlands. Stanley King had become president by April 1920 when the Sable Lumber Company wound up its business in Nova Scotia. Three-quarters of the woodlands of more than 51,000 acres were acquired by Goodspeed & Furbish of Massachusetts and the other quarter was split between G. F. Godding, Edwin D. Starratt and George S. McClearn of Liverpool, Nova Scotia. All the sawmills, track, rolling stock and other equipment had been moved to Wilkins Siding by June 1919 and it was disposed of there as junk or second-hand gear.

Tupper Warne of Digby had a logging railway with wooden rails in Digby County from 1910 to 1915, but nothing is known of the type of locomotive used. Like the other railways with wooden rails it probably had only limited success.

Besides the traditional demand for spruce and pine lumber, expanded construction in the eastern United States created a large market for hemlock used in sheathing boards, joists and rafters, and for yellow birch and hard maple for flooring. This was the first time there had been a significant demand in Nova Scotia for these species in the building trade. Lumber production was up to more than 246 million board feet in 1929.[69]

Tractors and motor trucks were replacing horse-drawn rigs for hauling logs, pulpwood and lumber, although perhaps more slowly in Nova Scotia than most places in North America. This improved facilities to replace stationary sawmills sawing river-driven logs with steampowered portable mills. The portable mills were getting into woodlands far from drivable waterways. Good prices and lumber demand, together with the relatively low cost and portability of the small mills, brought a concentrated attack on small woodlots containing a half million feet or more, particularly those lots near public roads.

Living conditions in the logging woods were difficult for the woods workers but the workers were tough. Most of them wore heavy woolen underwear, summer and winter, and few took baths in the winter. Fleas, lice and bedbugs were still common in most Nova Scotia logging camps in those days—and indeed until the use of DDT in the 1940s. Not all camps had such vermin and most of the men lived cleanly when at home, but there were usually a few who carried these pests into the camps.

CHAPTER 29

KEEPING TRACK: THE DEPARTMENT OF LANDS AND FORESTS

Legislation passed in 1910 included provision for granting or leasing small lots of Crown land completely surrounded by previously granted land.[17] Provision was also made for licenses to cut timber on Crown land and the period of a license was two years. A considerable acreage of Crown land was granted after this and it was not until the early 1920s that granting of Crown land was discontinued. During the first decade of this century additional Crown timber leases were issued covering thousands of acres. These leases were seldom larger than a few hundred acres, with the specifications and prices as stated for Chapter 3 of the Acts of 1899. Still no royalty was collected by the Crown when timber was cut. The licensee was to pay 40 cents per acre for the leased area, $1.00 per cord or $2.00 per thousand board feet for the stumpage cut, and the cost of the boundary survey. All timber cut under license was to be manufactured in the province, and rossing or peeling was not accepted as manufacture.

In 1927, cutting licenses were issued for 6,461 acres of Crown land and on these, 5,861 cords were cut.[69] Also in 1927 the Department of Lands and Forests received $6,000 as Crown land rental from Oxford Paper Company and $1,250 from the Clyde and Sissiboo Pulp Company Limited. By 1930, cutting license income for the province was still paltry. A number of trespassers were caught cutting on Crown land in 1928, 1929, and 1930 and they were required to pay double stumpage, amounting to $2.00 per cord or $4.00 per thousand board feet.[69]

Around 1912 timberland owners outside the boundaries of school sections paid no taxes except for a quarter-cent per acre fire tax. This was changed in 1917 with the passing of Chapter 6, "An Act Respecting Land Taxation."[17] It provided for every occupant of 500 acres and upwards to pay a tax of 1 per cent of the assessed value of the land. Provincial land assessors were appointed by the Governor in Council and they were to "fix the value of the land at any such sum greater or less than $1.00 per acre." These taxes were paid to the municipal clerks who passed them on to the provincial treasurer. Before 1927, this act was revised so that only properties of more than 1,000 acres were taxed, and only on the acreage over 1,000.

As usual in forest taxation, there was discrimination against the owners of the larger acreages. In 1927, owners of more than 25,000 acres were taxed an average of 3.3 cents per acre; those owning from 5,000 to 25,000 acres paid 2.3 cents; while owners of from 1,000 to 5,000 acres paid 1.4 cents. Apparently, this increased charge was not because the per acre value of the larger holdings was higher but because the assessors considered that the owners of larger holdings had a greater ability to pay. In most cases, the larger holdings were the most inaccessible lands and, other factors being equal, therefore less valuable.

The municipalities then started taxing lands outside their school sections, which were mostly the larger holdings. The municipal assessors also tended to assess the larger holdings more highly per acre than the smaller ones, particularly those owned by non-residents of the municipality.

Chapter 21 of the Acts of 1921, the Forests and Game Act, introduced important new forest legislation and prepared the way for a new Department of Forests and Game.[17] It provided for the Governor in Council to appoint a Commissioner of Forests and Game. His duties were to conserve and protect the forest from fire; to protect, preserve and propagate game and game fish; to disseminate information regarding these matters and the provincial laws related to them; and to attend to the enforcement of this legislation.

J. A. Knight, K.C., who had been chief of the three-man Game Commission, was appointed Commissioner of Forests and Game. He engaged a small office staff and several game and fur inspectors. The revenue to support this new department came largely from the sale of hunting licenses and royalties on fur.

The annual report of the Department of Forests and Game for the fiscal year ending September 30, 1924 showed a revenue of $28,381.49, comprised of $19,965.80 for sale of licenses, $5,977.84 in royalties on furs, $1,877.56 in fines and forfeitures, and the balance miscellaneous. Expenditures were as follows: inspectors and warden service, $10,554.04; chief forest ranger salaries, $3,050; other salaries, $6,680. Combined with other items such as travel expenses, printing, and stationery, expenditures totalled $25,737.04. This gave a net surplus of $2,544.45.

For the same period the Department of Crown Lands had a total revenue of $21,926.22 and expenditures amounting to $7,793.40, mainly in salaries. This department's surplus for that fiscal year was $14,132.82. The purchasing power of the Canadian dollar at that time was approximately 4.6 times that of 1980, making a gross total revenue of about $231,000 and a net surplus of about $77,000 in 1980 dollars.

In a provincial election in the summer of 1925, the Armstrong Government was defeated and a Conservative government was elected with E. N. Rhodes as Premier. As was common practice then, the entire staff of the Department of Forests and Game was dismissed and F. A. Harrison, the Deputy Commissioner of Crown Lands, was appointed Acting Commissioner of Forests and Game.

The following year legislation was passed which merged the Department of Crown Lands and the Department of Forests and Game to form the Department of Lands and Forests. Known as the Lands and Forests Act, this legislation appointed the Attorney General as Minister of Lands and Forests. His duties included supervising and controlling Crown lands, surveying and recording forests and wild lands, conserving and protecting all forests whether Crown or privately owned, and preserving and propagating game and game fish.

The Governor in Council was responsible for appointing a chief forester and for determining his salary. The duties of the chief forester included being in charge of all Crown land maps and seeing that they were kept up to date by plotting new surveys thereon. When sufficient data were obtained he was to prepare a set of proper cadastral plans of the province. He was chief of the forest ranger service and was to conserve and protect forests from fire. He was also expected to inspect Crown lands and guard them against trespassers and to see that regulations of Crown leases were adhered to.

As chief scaler, the chief forester was to supervise the scaling of timber cut on leased Crown land. As chief provincial surveyor, he was to survey all Crown lands and estimate the amount and value of timber thereon. He was to further reforestation and scientific forestry and to make an annual report in writing to the Minister by September 30 of each year, covering all his duties and his work.

John C. Douglas was Attorney General and Commissioner of Crown Lands in 1925 and it was he who ushered the Lands and Forests Act through the legislature in 1926, becoming the first Minister of Lands and Forests on May 1 of that year. He later resigned and was elected Member of Parliament for Antigonish-Guysborough and died a few months later. He was replaced as Attorney General and Minister of Lands and Forests by W. L. Hall of Liverpool.

The annual report of the Department of Lands and Forests for 1926 shows that the province was divided into 10 ranger districts with a total of

10 chief rangers, 61 subrangers and 560 voluntary rangers. The chief rangers were full-time employees who were paid $100 per month; the subrangers were employed only during the fire season and received $75 per month during that period. The voluntary rangers were paid only when fighting fire.

In 1926, F. A. Harrison was dismissed and Otto Schierbeck was appointed chief forester. Schierbeck was a Danish forester who had been employed by Price Brothers in Quebec. He had previously won a prize of $5,000 offered by F. J. D. Barnjum, then President of MacLeod Pulp and Paper Company Limited, for the best treatise on the spruce budworm. Barnjum had then engaged him to survey and cruise the MacLeod Pulp and Paper Company lands. This was around 1920. A few technical foresters had worked in Nova Scotia as timber estimators and perhaps on other projects of short duration before the 1920s, but Schierbeck was the first technical forester hired on a yearly basis. The second was G. L. Knapton, a New Englander, who was woodlands manager for Sonora Timber Company from 1924 to 1933. The third was E. S. Richards of Ottawa, chief forester for Mersey Paper Company from 1928 to 1933. Following as it did on Barnjum's election to the provincial Legislative Assembly in 1925, Schierbeck's appointment appears to have been due to Barnjum's influence. Schierbeck had a stormy and controversial career in Nova Scotia, but he had the energy and self assurance to break new ground and get things done.

In time Schierbeck built up a competent staff which included John Condon, an engineer in charge of Crown land plans and records. Brian Alexander and David Hudson, student foresters and later graduates of the Forestry School at the University of New Brunswick, carried out cruises on Crown lands along with Hiram Thomas and others. J. D. Lockwood and H. L. Fenerty were employed in the office as fire inspectors and on game patrols and Clarence Mason was inspector of game sanctuaries.

During 1926 a provincial forest nursery was established at Lawrencetown, Annapolis County, managed by another Danish forester, A. M. O. Gold, who had served overseas in the Canadian Forestry Corps during World War I and had purchased a fruit farm at Lawrencetown after the war. In the same year some 3,000 acres of land near Waverley, Halifax County were set aside for the Boy Scouts and in time this area was enlarged to become the Waverley Game Sanctuary.[51]

According to Department of Lands and Forests reports, the total Crown land in the province averaged approximately 1,425,000 acres from 1927 to 1930, varying from 1,416,000 acres in 1927 to 1,430,000 acres in 1930; these figures are uncertain, however.[69] Of the total Crown land shown during this period, about 890,000 acres were held under leases. These reports also showed the total freehold land in ownerships of 1,000 acres or more as averaging

3,343,000 acres during this four-year period; this figure would probably be more accurate if increased by 10 per cent or more. Reported statistics showed these ownerships for the four years as follows:

Ownership Class	Average Number of Owners	Average Reported Acres
25,000 acres plus	22	2,337,000
10,000-24,999 acres	25	381,000
5,000-9,999 acres	30	205,000
1,000-4,999 acres	197	420,000
Total	274	3,343,000

Forest production statistics before 1930 are incomplete. In 1928 some 669 sawmills were reported to be operating in Nova Scotia and in 1930 there were apparently 838 sawmills. From the data available, the production was as follows:

Product	Quantity	
	1928	1930
Lumber	226,181,000 bd.ft.	224,439,000 bd.ft.
Railway ties	1,443,000 bd.ft.	4,492,000 bd.ft.
Shingles	1,962,000 bd.ft.	1,952,000 bd.ft.
Laths	17,310,000 bd.ft.	2,204,000 bd.ft.
Staves and headings	11,653,000 pces.	29,284,040 pces.
Wooden ware	n.a.	2,225,000 bd.ft.
Mine timbers*	n.a.	38,343,000 bd.ft.
Poles and piling	n.a.	7,076,000 bd.ft.
Boxes and crates	n.a.	5,567,000 bd.ft.
Pulpwood export	195,000 cords	151,886 cords
Pulpwood local	n.a.	170,921 cords

*includes pitprops

The reported grand total wood utilization for Nova Scotia in 1930, excluding fuelwood, was 442,264,000 board feet.[69]

In 1930, the controversial Bill 151 was introduced in the Legislative Assembly. It was to regulate the export of pulpwood from any forest holding of more than 1,000 acres and was bitterly contested. At that time, more than two million acres of Nova Scotia woodlands were owned by companies of the

United States and many Nova Scotians were also involved in the export of wood from these lands and other lands owned by Nova Scotians. This bill also prohibited export of pulpwood cut on Crown lands.

The Acts of 1900, stating that the Governor in Council "may . . . prohibit export to foreign countries, pulpwood, timber or wood cut or removed from Crown land to be used in the manufacture of pulp or pulp products," had laid the groundwork for this bill. The same section is found in the Revised Statutes of 1923 and in the Lands and Forests Act of 1926. Until 1930, however, the exportation of unmanufactured wood cut on Crown land was prohibited in every province except Nova Scotia. Bill 151 had its second reading but was not passed. Export of Crown land pulpwood was supposed to be prohibited and it was, after the Oxford Paper Company's operations ceased in 1931.

Thus the first 30 years of the twentieth century ended with forest and wildlife management in Nova Scotia gradually coming into its own with the establishment of the Department of Lands and Forests under Otto Schierbeck.

The stock market crash of 1929, however, ended a period of prosperity for the forest industries of the province.

FIRES

Around the turn of the century significant acreages were still being cleared for agriculture and urban use. Many meadows were burnt annually for hay growth and barrens were burnt periodically for production of berries. There were fewer forest fires then than now, but they were often unattended unless they threatened settlements, and therefore burnt much larger areas. When fires were attended, the equipment comprised only axes, shovels, grub hoes and water pails. Most firefighting was done between sunset and a few hours after sunrise; usually it consisted of attempting to narrow the leeward front or stopping the fire at water or some other break in the vegetation.

The summer of 1902 was dry and forest fires were common, especially in western Nova Scotia. Extensive areas of Yarmouth, Digby, Queens and Shelburne counties were burnt over, including the Port Joli and Port L'Hebert districts and the rock barrens where these counties join. There were also large fires in Annapolis, Kings, Guysborough and Cumberland counties in this dry year. Dr. C. D. Howe stated in 1912 that there were "over a half million acres of recent burns (including those of 1902) in Nova Scotia proper, on which the re-establishment of timber trees is at a standstill and will be for many years to come, even if future fires are excluded."[70] From 1900 to 1914, more timber was lost to fire, disease, storms and old age than was harvested. From 1915 to 1926 inclusive it was reported that 1,068 forest fires had burned approximately 292,800 acres. According to a statement in the Department of Lands and Forests Report of 1937, there were only 15 forest fires in Nova Scotia in 1917, burning a total of 205 acres. In 1920, 113 fires burnt 77,447 acres and in 1921, 256 fires burnt 77,0ll acres.[69]

The Springfield Railway of the Davison Lumber Company was responsible for forest fires which burnt probably more than 100,000 acres in Annapolis, Kings and Lunenburg counties. Guy Westhaver of Fox Point reported that a fire from this railway in 1910 reached his home on the western shore of St. Margaret's Bay —a distance of about 40 miles.

There were two serious forest fires on the Miller lands during their ownership. The first burnt about 10,000 acres in the heart of the St. Margaret's Bay lands around 1909, starting on land which had been clearcut by the Millers from 1905 onward. A half-hearted attempt was made to reforest this burnt area by importing several bushels of seed of Norway spruce, Scots pine and European larch from Scotland. The only effort to use this seed was made by Bert Christie, the walking boss (logging superintendent). He filled his pockets with seed when making trips to camps beyond the burnt area and flung them out at what looked to him to be good sites along the tote road. The rest of the seed was left in gunny sacks in the warehouse until it rotted. Some of this broadcast seeding was successful. By 1930 there was a scattering of trees of each of the three species 20 to 30 feet tall along the tote road, and some of the Norway spruce bore cones. However, porcupines gave these exotic trees a hard time.

The other fire on Miller lands burned several hundred acres, mostly pine and hardwood, north of Tobeatic Lake, Queens County in May 1923. This fire almost crossed the narrows in the lake but it was stopped there by Ambrose Beach, with seven other men, using only axes, mattocks, shovels and pails. Had it crossed the narrows it could have destroyed thousands of acres of top quality spruce, pine and old-growth hemlock. Some of the pine killed by this fire was salvaged by the Huskins Brothers of Milton, but most of it was lost to wood-boring insects.

Until this time there had probably been no forest fire gear other than buckets, axes, shovels and mattocks. In 1922, the need for proper firefighting equipment had been recognized by an amendment to the Forests and Game Act[17] authorizing the purchase of firefighting equipment and the erection of fire towers. Over the next few years some municipalities bought motor pumps and other equipment and some private companies did likewise. Firefighting costs were still paid by the municipalities in 1926, but the following year the province relieved them of that burden.

By 1927 there were 11 steel fire towers, 23 wooden towers and 17 observation posts in Nova Scotia. Nine of the steel towers had been built by private companies between 1923 and 1927 and four wooden towers were provincial, built before 1927. The other towers and observation posts were built mostly by the provincial rangers in 1927 at a cost of $1,236.23 plus the rangers' salaries.[69] The towers, all near telephones, had a system of direction finding for smokes sighted and these observations were reported to the chief district ranger. When the latter had reports from two adjacent towers he was able to locate a fire reasonably accurately on his map and get fire crews to it as soon as travel conditions permitted. Such conditions were much worse than they are now.

The Nova Scotia Timberlands Company, A.P.W. and Hollingsworth and Whitney each had two motor forest fire pumps with hose and accessories available for use by provincial rangers before 1927. These first pumps were

Evinrude two-cylinder gasoline pumps weighing 104 pounds each, capable of delivering pressure up to 200 pounds with a maximum capacity of 75 gallons of water per minute.[69] The usual hose was linen, 1 1/2 inches in diameter—30 100-foot sections with each pump. Schierbeck stated that one reliable motor pump was as effective on a fire line as 25 men working with hand tools and he urged the municipalities to buy additional fire pumps. The Municipality of Lunenburg owned one in 1927.

The municipality of St. Mary's purchased a number of small rubber-lined packsacks which were supposed to be watertight, each with a capacity of five gallons of water and a hand pump. Made by the Wajax Company of Montreal, which had started to specialize in forest firefighting equipment, these were known as Wajax pumps. They served well in fighting fire. The chief ranger for the Guysborough, Pictou and Antigonish counties district was supplied with 24 of these in 1927.[69]

It was at this time that the Canadian Forestry Association sought help from the Meteorological Service of Canada regarding forest fire weather forecasting. The Meteorological Service assured the Nova Scotia Department of Lands and Forests that there would be five meteorological stations, equipped for this purpose, distributed evenly over the province for the summer of 1928.

The first year that permits were required by law for the burning of brush between April 15 and December 1 was 1926, and 847 permits were issued. In 1927 the number increased to 2,573. In that year there were 16 convictions of burning without permits and the offenders were fined $680 in all.[69] Also in 1926 each operator of a portable sawmill, within 60 rods (990 feet) of forest land, was required to obtain a permit to operate the mill. In 1926, 197 mills were inspected and in 1927 the number had risen to 280. Blueberry fires in 1926 covered some 18,000 acres. Being barren land, these were not included in the statistics as forest fires, but they were a forest fire hazard.

Fortunately, 1927 to 1929 were relatively quiet years with only 605 fires burning a total of 14,742 acres. But 1930 was a particularly bad year, with 509 fires burning 46,188 acres. This acreage was reported to have been 3 per cent timber, 6 per cent cut-over, 33 per cent young growth, and 58 per cent barren. The causes of fires that year were reported to have been as follows:[69]

Cause	No. of Fires	Acres Burnt	Cause	No. of Fires	Acres Burnt
Unknown	177	11,909	Railways	68	8,757
Buildings	13	138	Sawmills	6	5
Campers	14	323	Children	24	1,027
Lightning	6	248	Smoking	59	3,051
Brush burning	33	7,539	Fishermen	31	5,706
Berry pickers	23	727	Incendiary	55	6,758

The summer of 1930 was the driest in Nova Scotia for a century, according to Schierbeck. As early as March one fire burnt two acres, and in April 78 fires burnt 2,423 acres. May was the worst month with 177 fires burning 33,669 acres, but forest fires continued into September, when 72 fires ran over 3,153 acres.[69] Western Nova Scotia suffered the worst damage with 163 fires destroying 25,961 acres. On one day in May 1930 there were seven separate fires in southern Queens County alone. On May 7 the most destructive forest fire started near Milton, Queens County about 2:30 p.m. and before 3:30 p.m. it had reached the shore of Liverpool Harbour between Liverpool and Brooklyn, more than three miles from where it started. The blaze destroyed 37 homes on the outskirts of Liverpool and Milton.[69]

That year the Department of Lands and Forests owned or controlled 24 motor pumps, 28,000 feet of hose and 187 hand pumps but this equipment had to serve the whole province. It was fortunate that Mersey Paper Company had six motor pumps with thousands of feet of hose and many Wajax back-tank hand pumps. Many homes were saved by hundreds of men and women, and furniture was saved from most of the houses burned. Water being low in the few brooks in the area, people kept their roofs wet with water pumped or lifted from their own wells. The fire was quelled that night after burning more than 12,000 acres. There is no record of casualties. On May 8, the Attorney General Laurie Hall issued a proclamation closing all forests to public travel without permits issued by fire rangers. This continued in force until October.

CHAPTER 31

DISEASES AND PESTS

A wide variety of disease and pests affect the forests of Nova Scotia. Some, like ticks, seriously affect forest workers, while others, such as the spruce budworm, white pine weevil, beech bark disease, and white pine blister rust continue to disturb the forest economy.

RUSTS

Apparently, northern Asia is the native habitat of white pine blister rust; the disease is believed to have originated there on a native pine similar to our eastern white pine.[73] From Asia, it gradually spread to Europe where it found eastern white pine *(Pinus strobus* L.*)* trees, introduced from America, a highly susceptible host. By 1900 it had spread over most of western Europe. A two-host fungus, it alternates between plants of *Ribes* (currants and gooseberries) and white pine. It never spreads from pine to pine nor from *Ribes* to *Ribes*. It forms blisters on the living branches or twigs of pines or on the main leader and these blisters gradually girdle the limb or stem. In time they usually extend down to the trunk of the tree and girdle it. The part of the tree above the girdle dies, eventually taking the entire tree.

Besides the cultivated gooseberries and black, red and white currants and hybrids of these, there are six species of native wild *Ribes* in Nova Scotia.[74] Cultivated plants often persist for many years after the farms on which they were established have been abandoned and are often found in forests that are 60 or more years old. Where white pine occurs within a mile of, say, a patch of black currants, these currant plants continue disseminating blister rust spores to the unfortunate pines.

In North America, the disease was first found on species of *Ribes* at Geneva, New York in 1906 and there are indications that it was in the northeastern states as early as 1893.[73] It was not until 1909 that the disease was discovered on white pine seedling stock shipped into the northeast from a German nursery. The next year, it was also found on shipments from French nurseries. Although it was known that the blister rust had found its way into Nova Scotia several years before 1929, it had been found only on species of currants. Dr. J. H. Faull, Professor of Forest Pathology at Harvard University, then found a few young white pine trees about nine feet tall infected in a plantation near Chester.

The stages of the disease are too complicated to discuss here but the conspicuous orange-red blisters on pine branches or stems are outstanding. When a side branch is attacked and killed quickly, a red-brown "flag" is formed beyond the lesion. This conspicuous flag is dead foliage and can be seen for hundreds of yards.

The main method of control of this blister rust is the removal of *Ribes*; and *Ribes* eradication has been carried out extensively in the northeastern states but has not been done in Canada. It was said to have been economically justifiable up to the early 1950s but labour costs would probably prevent such control now.

Although Roland stated, in *The Flora of Nova Scotia*,[74] that a species of gooseberry is common throughout Nova Scotia and a species of currant is common to abundant throughout the province, Kingston and McGinn,[75] in their report on white pine blister rust, stated that it was difficult to find any *Ribes* except in northern Nova Scotia and that which was cultivated elsewhere. This has also been the writer's finding. Perhaps for this reason, blister rust is much less common in Nova Scotia than in the New England states. Kingston and McGinn found a severe infestation at Centreville, Kings County where a currant and/or gooseberry farm was less than a half mile from the badly infected pine forest. Of the seven areas examined in Nova Scotia by these observers, damage ranged from zero to 31 per cent, with an average of 10 per cent.[75] Today, widely scattered blister rust on pines occurs in most of Nova Scotia.

TICKS

The dog ticks which apparently reached Nova Scotia via New France, Digby County between 1895 and 1899 spread slowly at first.[53] Until 1935, they were basically confined to Digby County and northern Yarmouth County. By the late forties they had reached the Lake Rossignol country and today they are east of the LaHave River, particularly near the south shore.

Ticks are not insects. They are arachnids—related to spiders and similar to large mites—and affect forest workers, forest travellers, and other mammals. The American dog tick is classed as a hard tick as it has a tough leathery body covering, or cuticle, that is capable of great distension as the tick engorges itself with the blood of its host. When mature, these pests are slightly more than an eighth of an inch long, flattened and tapered toward the head. The male tick does not become greatly enlarged in feeding but the female sometimes grows to a length of more than a half-inch and a diameter greater than three-eighths of a inch.

There are four stages in the tick life cycle: egg, larva, nymph and adult. An adult female, in her single oviposition, sometimes lays 18,000 or more eggs in one batch on or near the ground just before dying.[76] The larvae usually feed on the blood of small animals, and on the adults on large mammals such as dogs, deer and people. The life cycle generally takes about two years in Nova Scotia.

Ticks are commonly found in the spring in their "waiting position" on grass, brush and other low vegetation. They sometimes infest camps in grassy or bushy areas and drop onto their hosts from the ceilings. Unfed dog ticks can endure frigid weather in grass and brush but eggs and engorged ticks are susceptible to mortality from low temperatures. They can endure long submergence in water but they usually die quickly in a very dry situation. They are most abundant in shrubby areas or in tall grass and scarce in heavily wooded areas. Insertion of the mouth parts into the skin of a mammal produces an inflammatory reaction and swelling of the flesh around the feeding tick. A neurotoxin in the tick's saliva usually prevents the host from feeling the bite. If the tick is removed forcibly, the mouth parts may be torn off and left in the wound. This often causes infection.

Tick paralysis is generally caused by an engorging female feeding near the spine at the base of the skull, and is probably caused by the neurotoxin in the tick saliva. American dog ticks also transmit Rocky Mountain spotted fever and tularemia. Any of these may be fatal, but to transmit them a tick must feed for four to six hours or more, so most adult people are safe.

Before 1955, no Rocky Mountain spotted fever was reported north of southern New Hampshire and most of such cases and tularemia have occurred in the southeastern United States. No case of Rocky Mountain spotted fever has been reported in Nova Scotia but there have been several cases of tularemia, also known as the rabbit disease. It is believed that these have all resulted from infection from the blood of slain diseased rabbits getting into open cuts or scratches of hunters. Nevertheless, there is the hazard of a person being infected with tularemia in Nova Scotia from a dog tick feeding for four hours or more. Dog ticks are in Nova Scotia to stay and it is doubtful if they can ever be eliminated. They will probably spread throughout most of the province.

BUDWORMS

In the early 1920s, a spruce budworm infestation in Cape Breton spread, causing considerable spruce and fir defoliation in southern Inverness and Victoria counties, and in western Richmond and eastern Guysborough counties. By 1927, it had reached as far north as Margaree Harbour and Englishtown and east to St. Peters in Richmond County.[69]

In the wet summer of 1927, parasites were found attacking the larvae and fungi attacking the pupae of the budworm. It was estimated that about 75 per cent of the insects had been killed thereby. That summer, the Entomological Branch of the Dominion Department of Agriculture, with the co-operation of the Canadian Air Service, conducted an experiment in aerial dusting of parts of the infested forests. This was man's only attempt to control the spruce budworm in Nova Scotia by using chemical insecticides. The plane was of the type used in dusting cotton fields in the southern states and it was flown by Charlie Bath, a fighter pilot who had been seriously wounded in a plane crash in the First World War. Following the war, he became, along with Duke Schiller and Col. Bill Williams, one of the famous bush pilots. The insecticides used were calcium arsenate and lead arsenate in a very fine powder.

This spruce budworm infestation was practically finished by the parasites and fungi before 1928. Although thousands of larvae were killed by the experimental insecticide dusting, the areas dusted were too small to have had any significant effect in stopping the outbreak. There had been a moderate to heavy spruce budworm infestation in Victoria and Inverness counties in 1915-17 but this apparently collapsed in the same way as the infestation of 1923-27.

This species of insect has probably been in spruce-fir forests in Nova Scotia since such forests first became established here after the last glacier. An expert silviculturist, the budworm has managed these forests in large parts of northeastern America extremely well for its own purposes. According to Dr. F. E. Webb, Director of the Maritime Research Centre of the Canadian Forestry Service in 1972, parts of the Maritime provinces were ravaged in epidemics at least three times in the eighteenth century and four times in the nineteenth century, and outbreaks have occurred at least three times so far this century.[77,78]

The spruce budworm infestation was well established and had increased in Victoria and Inverness counties and the northeastern mainland of Nova Scotia by 1951 but there was little tree mortality to that time. Until 1970, the infestation was sporadic, causing severe defoliation on some areas in Cape Breton and some spruce and fir mortality on the highlands in some years; at other times, the populations almost completely collapsed. By 1970 there were infestations of various intensities throughout much of Cape Breton, western Cumberland County, Antigonish County and northern Kings and Annapolis counties. Besides the spruce budworm, the black-headed budworm and the hemlock looper occurred in Cape Breton periodically, attacking spruce and fir. This was the beginning of the end of the existing spruce-fir forests in Cape Breton and in places on the mainland.

By harvesting the mature or overmature spruce-fir forest on extensive areas, the budworm provides ideal conditions for the growth of the dense spruce and fir regeneration, which generally exists as the understory or which follows within several years after the removal of the mature forest. Within 20 years this even-aged understory or new stand has become the overstorey, ripe for the budworm again by the time the new mature forest is from 60 to 80 years old. Between outbreaks, budworm populations decrease but the insects continue, endemic (in small numbers), feeding unobtrusively on the foliage of spruce and fir until this new crop of trees is ready for their "harvesting."

When conditions are right, these insects multiply and spread with amazing rapidity. Usually their eggs are laid in July and hatch in about 10 days. These tiny larvae disperse on silken threads throughout the spruce-fir canopy and spin shelters in bark crevices where they remain dormant through the winter until late April or early May. Emerging, they mine and feed on flower buds, foliage buds and new shoots. In all they pass through six instars or larval stages. In the last of these the larvae reach their maximum size of almost an inch long. It is at this stage, feeding on new foliage in early June, that they do most of their damage. They then pupate and emerge as moths from late June to late July, completing the life cycle.

The virgin female moths cannot fly. Within days of emergence from the pupal stage, they mate, lay a few egg masses the second day and—their load of eggs lightened—can then flutter away. They take wing at night, ascending to warm air layers 1,500 to 3,000 feet above the earth. Radar studies indicate that this dispersal flight lasts over two hours, with the moths alighting early in the morning up to 60 miles from their starting places.[77]

Each budworm moth lays about 200 eggs. To maintain a stable population, only a few of the insects from these 200 eggs need to survive. From 60 to 80 per cent of the small larvae generally die during the dispersal stages and intervening winter, constituting the greatest loss of these insects within the generation. The most critical period in the budworm's life cycle occurs in June when the larvae are large. They are then exposed to predators, disease, and unfavourable weather and many starve when foliage becomes unavailable. In rising epidemics, up to 50 per cent of these large larvae may survive to the pupal stage; when trees are heavily populated and heavily defoliated, less than 10 per cent survive. Birds, insects and spiders, along with budworm disease micro-organisms, provide some control when budworm populations are small but they are not strong influences. Unfortunately, these control factors generally do not increase as the budworm population increases. Warm and dry weather in late June and early July favours the budworm, while wet and cold weather in this period is quite detrimental.

The budworm's favourite host is balsam fir, followed by white spruce and red spruce in that order, with occasional larch and white pine. Black spruce needles are generally too tough for this insect but are eaten at times.

Budworm defoliation, followed by mortality of extensive spruce-fir forests, has an effect in this forest type similar to that of clearcutting large areas. Assuming that the tree species which seed about the time of the demise of the mature or overmature forest is in the same proportion as the trees which have died or been cut, the new forest will usually contain a larger percentage of fir. This is true particularly if the summers following the death or cutting of the older trees are dry. Fir seedlings have longer roots than do spruce seedlings and are thus more capable of surviving drought. So the spruce budworm tends to perpetrate and increase forests best suited to its purpose—namely periodic outbreaks of budworm at 60- to 80-year intervals.[78] In clearcutting spruce-fir forests without silviculture, man is aiding and abetting the budworm in its widespread "program" of increasing the fir content of the forests of Nova Scotia. The natural regeneration of many clearcut spruce-fir—and even white pine—areas has been noted to have a higher fir content than the preceding forest. In some cases, the fir totally dominates.

APHIDS

In the 1920s, and even well into the 1930s in some areas, Nova Scotia's hardwood forests of beech, yellow birch and hard, rock or sugar maple that grew on ridges and well-drained slopes were beautiful. Standing with these species were occasionally ironwood, red oak, ash and black cherry. These hardwoods were often mixed with red spruce, hemlock and/or white pine, especially on the upper slopes. Mostly old growth forests at that time, the beech, birch and maple trees were generally large, healthy and widely spaced. There was little or no underbrush and these hardwood forests were quite parklike.

In Nova Scotia, beech trees once reached heights of 60 to 85 feet, diameters at breast height of 16 to 24 inches and ages of 300 or more years. The yellow birch grew to 80 or 90 feet tall, two to three feet in diameter and had a life span similar to that of the beech. The sugar maple lives to 300 or 400 years, reaching heights of 70 to 95 feet and diameters of 20 to 36 inches.[79] Because of the difficulty of floating hardwood logs to the stationary sawmills and the insignificant demand for hardwood in Nova Scotia until the 1920s, these beautiful forests were largely left unmolested. But then the beech bark disease started killing the beeches. This disease, first found in North America around Halifax in 1920, spread slowly throughout the province, then westward and northward throughout New Brunswick, southeastern Quebec, the New England states and New York State by 1970.[80] There is evidence that it was present in Nova Scotia as early as 1890, likely introduced from Europe on nursery stock brought over for ornamental purposes. It was killing trees in Cape Breton before 1927 and by 1931 the effects of the disease could be seen in every part of the province, as well as in Prince Edward Island and areas of New Brunswick. Some beech trees seemed to be immune to the disease. Today these are found widely scattered and displaying the beautiful smooth, light gray bark of healthy beech. There are also stands of healthy beech on the higher ridges of North Mountain in Annapolis County but these are not old-growth parklike forests such as those previously mentioned.

The disease damage results from the sequence of a beech scale insect (a species of aphid) infestation followed by infection with the parasitic bark fungus *Nectria coccinea*. There are apparently a number of other species of aphids and *Nectria* fungi associated with the disease which play an important part in its etiology.[81,82] The bark of trees affected by this disease becomes roughened with craters and swellings or cankers. Trees may live with this condition for decades, with the cankers and lesions spreading up and down the trunk and almost entirely circling it. When the disease completely girdles the tree, at any point on the trunk, the tree dies—but the roots remain alive to produce suckers. These usually have the bark disease by the time the sucker stems reach a few inches in diameter, but they may live until they reach diameters of 10 inches or more.

Sucker trunks are gnarled and rough and, as the tree grows, this condition continues in the wood. For this reason, the wood of diseased trees is almost worthless although it is still used as firewood. One of the heaviest hardwoods, healthy beech wood has good even grain and is used for woodenware, furniture and flooring. It was the best native hardwood for firewood. However, the diseased wood is split with great difficulty so that now bolts of more than four inches diameter are of little value for firewood. As the mature dying beech put out the sucker growth mentioned above, the parklike open hardwood forests which contained much beech developed thickets of ugly gnarled beech trees which grew from six to eight inches in diameter and produced new suckers from their roots before dying. These in turn became diseased—a cycle which may continue indefinitely on many areas of good soil.

Another important insect pest introduced directly into Nova Scotia from Europe is the balsam woolly aphid, which started attracting attention in the province during the 1920s. Although observed by Schierbeck and other foresters several years earlier, the stunted tree tops and swollen twigs caused by this insect were first reported as "gout" by Dr. J. H. Faull in the Department of Lands and Forests Annual Report of 1929. He apparently considered it to be a viral disease. In this same annual report, Dr. J. M. Swaine reported the balsam woolly aphids to be spreading throughout the province; however, he was referring only to the stem type of attack. In the stem or trunk attack the aphids, too small to be seen by the naked eye, cover themselves with a thread-like white waxy substance which is quite visible—thus their name "woolly." In a moderately heavy stem infestation, masses of aphids give the tree trunk a white-spotted appearance; a very heavily infested stem looks almost entirely white. Trees so infested die within a year or two of attack.

The "gout" symptoms consist of swelling and distortion of small branches and twigs throughout the crown of the tree— although the swelling is most evident in the top. Swelling is usually particularly large at the nodes and around the buds. The branches and twigs become distorted and twisted and the top twigs and branches die. Often trees become flat-topped.

Although this insect is small, it has a stylet or mouth tube nearly a quarter-inch long which it inserts through the bark of the tree into the cambium to feed. The localized swelling of the tree is the result of stimulation caused by injection of saliva. A moderately infested tree may live for 20 years or more after attack, with accelerated diameter growth but greatly decreased height growth until the top is dead. Many fir trees in the Maritime Climatic Region (Zones 5B, 6A, and 6B shown on the plant hardiness map) reach 10 inches in diameter and a height of only 18 to 20 feet.[83] The wood where aphids have fed is described by some lumbermen as "boxy." It is similar to compression wood: hard and brittle and reddish. Being mostly lignin with little cellulose, it is of low value for pulp or lumber. When sawn the lumber warps, splits and twists out of shape as it dries.

The aphid attacks trees of all ages and regeneration beneath heavily infested larger trees is often killed within a few years. However, immature fir trees growing in the open on cutover or burnt areas in the Maritime Region show little evidence of damage until they reach heights of 15 to 20 feet. Because of the threat of aphid attack, most areas where regeneration is mostly fir are better suited to Christmas tree production, if economically viable. On most lands, because of the aphid and red heart rot caused by a fungus, *Stereum sanguinolentum*, if fir is permitted to grow to pulpwood size it is of poor quality.[83]

This balsam woolly aphid was undoubtedly introduced into eastern North America from Europe, probably before 1900, on nursery stock. Apparently, it was introduced at more than one point, for it was established at one place in Maine by 1908 and present in considerable numbers in western Nova Scotia by 1910. By 1930 the insect had become established throughout Nova Scotia and Prince Edward Island and along the Fundy coast of New Brunswick. In 1934 it had covered the southern third of Maine and New Brunswick and most of Vermont and New Hampshire.[83] The adult is a winged aphid and is carried by wind. It appears that the insect reached western Newfoundland, some 70 miles from Cape Breton, by this means before 1950. Because it cannot survive temperatures of less than -30 degrees Fahrenheit above the snow line, it will probably not become a serious pest in the boreal forest of the Cape Breton Highlands, northern New Brunswick, or northern Maine.

Along with parasites from other parts of the world, numbers of a European species of insect predator *Leucopis obscura* (Hal.) were liberated in southern New Brunswick in 1933 and 1936.[83] Colonies of this predator were put out in Prince Edward Island and in Nova Scotia in 1941. They became well established and spread throughout the range of the introduced aphid, but are not sufficient to exercise sufficient control. It is interesting to note that scattered balsam fir growing with other tree species in colder zones escaped the aphid well into the 1930s. The writer measured good sound fir trees up to 18 inches in diameter and more than 80 feet tall in areas north of St. Margaret's Bay at that time. There are still good fir forests in Cape Breton and other places in Nova Scotia where temperatures reach very low points. But observant people travelling Nova Scotia's highways can see dead fir trees and many with "gouty" dead tops in most parts of the province.

WEEVILS

Another destructive insect in Nova Scotia, the white pine weevil, *Pissodes strobi*, is a native species throughout the white pine range in North America. It attacks many conifers, both native and exotic, but white pine is its principal host, followed by Norway spruce. Adult weevils hibernate in pine duff on the forest floor during winter and emerge early in the spring. Mating usually occurs soon after emergence and the weevils fly and/or crawl to the terminal or top growth of the trees to feed and lay eggs. A female weevil chews small cavities in the tender bark of the terminal growth of the previous year and may insert more than 400 eggs in these cavities from May to July. In a week or so, larvae hatch from these eggs, feed on the inner bark of the leader, pupate and emerge as adults in late summer.[80] The main leader of the tree is killed in the first attack, often when the tree is but a few feet tall. The lateral branches in the whorl below the lowest dead terminal then turn their tips upward, competing for leadership; one sometimes dominates but often several branches develop as leaders. As the tree grows repeated attacks occur, killing the main leader or leaders and the tree becomes grossly deformed, with many crooks, forks, branches and knots. Such "cabbage pines" are unsightly and generally unmerchantable.

White pine weevils tend to prefer vigorous immature trees with leaders that grow in full sunlight and they rarely attack leaders of trees more than 18 feet tall. Weevils seldom attack trees in partial shade. Herein lies the key to a natural solution which forest managers have in some areas emulated, and which is worth a short digression. White pine has been classed as a pyric species—that is, good even-aged stands can develop after fire. This is because old-growth pine trees usually survive fires which kill trees of other species. However, hot fires on clearcut lands when the soil is dry will destroy these pines as well and the subsequent growth is confined to intolerant (light-demanding) hardwoods. White pine has a deep tap root and is therefore quite wind-resistant. Widely scattered old-growth trees will generally stand for decades on areas cleared by cutting or fire, providing seed every three to five years. There are numerous white pine veterans 300 or more years of age scattered through Nova Scotia's forests. Most have cat-faces (fire-scarred butts) and are defective. Some have survived as many as four fires and provided good seed following each fire.

Soon after fire, areas of suitable soil are invaded by intolerant hardwoods: poplars, white birch, and gray birch. If the fire has not burnt into the soil, red maple and red oak are often produced as suckers from roots which survived the fire. These species grow quickly, providing partial shade for pine seedlings which become established after the deciduous trees have started growth. In this shade they are protected not only from hot sunlight and drying winds, but from weevils. When the pines reach heights of 18 feet or more, their crowns break through the canopy of the hardwoods, and within a few decades the hardwoods, which cannot tolerate shade, die out. This ultimately leaves mainly weevil-free stands which may be mixed pine and red oak, mixtures with other species, or pure pine.

But this is a long, slow process for growing good quality white pine. The process may be accelerated by shelterwood cutting and selection cutting, systems in which individual trees are removed in proportions of not over 40 per cent of the stand volume at any one cutting.[84] The remaining mature trees then provide seed and the partial shade required to protect the new pines from the white pine weevil. When this understorey reaches a height of 18 feet or more the residual trees of the overstorey may be removed with very little weevil damage in the second growth. Shelterwood cutting is a good way to maintain white pine forests. Conversely, planted or open-grown white pine is usually weevilled unless sprayed with pesticides.

In the 1930s, the value of white pine was so low it was not worth logging. In the Lake Rossignol district, Mersey Paper Company was clearcutting spruce, fir and hemlock pulpwood, leaving the pine and hardwoods standing. Despite warnings by the company's forester that this would result in considerable weevilled and deformed pine in the succeeding forest, the woodlands manager continued such cutting. There is now a great deal of weevilled pine in the new forests which will never be merchantable. At the time, this company had to have pulpwood at low cost in order to survive but the weevilled pine will always be a blot on its silvicultural history.

Although most abandoned farms and pastures in Nova Scotia revert to white spruce forests, in western Nova Scotia many restock to white pine. Nearly all of this pine is weevilled and worthless; only occasionally is old-field pine free of weevil attacks.

SAWFLIES

The American mountain-ash, small and branched and of no commercial value, is nonetheless a beautiful little tree, when not defoliated. It bears clusters of white flowers in June and clusters of scarlet berries from August or September that if not eaten by birds in the fall, persist well into the winter. Mountain-ash is mainly a wayside tree occurring in open woods throughout the province. Like the European mountain-ash or rowan tree, it is commonly planted as an ornamental.

Another forest insect introduced in North America from Europe was the mountain-ash sawfly. First recorded in Haines Falls, New York in 1926,[80] it now occurs throughout the northeast. This sawfly is a defoliator, feeding during July in clusters which may strip the foliage from a tree in a few weeks. Mountain-ash usually survives this defoliation for many years.

CHAPTER 32

CONSERVATION

Despite some promising early initiatives, the progress of conservation in Nova Scotia was sometimes painfully slow. Illustrating the need for new ideas and policies were the somewhat sketchy laws in place and the equally casual attitudes regarding their enforcement. In 1907, the Acts for Preservation of Game were again amended, setting the bag limit for moose at one animal. The killing of moose in Cape Breton was prohibited until 1915 and caribou and deer were protected until 1910. Fishing and hunting guides were required to be licensed and, in 1908, they became ex-officio game wardens. Some guides were conscientious but many broke the game laws.

SCHIERBECK

The year 1926 was probably the most important in forest and game conservation in Nova Scotia, for two reasons: the Department of Lands and Forests was established and Otto Schierbeck was appointed as its chief forester. Many progressive measures stemmed from him. Despite criticism and ridicule, he carried on ably until his discharge before the provincial election of 1933. The province and the Department of Lands and Forests are in his debt for many of the programs he initiated.

One such program was the establishment of wildlife sanctuaries. By an Order in Council dated October 29, 1927, Tobeatic Park was established as a game sanctuary, and an Order in Council dated August 10, 1928 added Liscomb Park as the second game sanctuary;[69] each contained approximately 200 square miles. The third game sanctuary, containing some 20 square miles, was established in 1929 near Waverley and the Chignecto Sanctuary of about 86 square miles was set up in Cumberland County in 1938. The sanctuary boundaries were drawn and marked by Clarence Mason, a colourful character well known to the sporting fraternity of this province, who was employed at that time as Inspector of Game Sanctuaries. These sanctuaries still exist and are manned year-round by provincial wardens. Although not all modern biologists favour the concept of game refuges, these areas have become valuable assets in wildlife studies and game control.

In the fall of 1927 there was a short open season on cow moose, with a special license issued to farmers. Although this special season may have been popular with a few, most sportsmen violently opposed it. Although the Minister of Lands and Forests, to please some of his constituents, had apparently fathered the legislation permitting this special season, it was Schierbeck who was asked to defend his Minister's actions when it became a hot political issue. Schierbeck wrote a number of articles in defense of this special season, contending that moose were monogamous, that the ratio of cows to bulls was out of balance and that, as a result, many cows were barren. He further argued that shooting a number of cows would bring the herd back in balance and in the long run benefit the moose. Because of the articles the wrath of the sportsmen was turned from the Minister and directed at Schierbeck. To make matters worse, Schierbeck about this time had his rangers carry out a moose census—a routine chore of game managers today, but in the Nova Scotia of the 1920s "counting moose" was considered idiotic. To the wrath already publicly heaped on Schierbeck was added ridicule.

A big thick-set man with a round pleasant face, Schierbeck was colourful in both speech and action. While fluent in English, he had difficulty pronouncing "th" and "j," and he had the habit of beginning a sentence with "Yesus du Yesus." When he was with other people he would sometimes remain aloof, taking no part in the conversation—and then suddenly he would make a remark that proved he had been listening.

BARNJUM

Another champion of conservation was F. J. D. Barnjum, who with F. J. Mosely & Company of Boston bought the MacLeod Pulp Company Limited in 1919. He then became president of the company, which was renamed MacLeod Pulp & Paper Company Limited. Barnjum spent the last 13 years of his life fighting for forest conservation. He maintained an outcry of "Save the forests," "Spare the trees" and "Preserve our natural heritage." When he retired a millionaire from business life around 1926, his hobby became a passion and then an obsession. He travelled across the continent many times, preaching to Canadians and Americans, urging governments to adopt policies of conservation and reforestation of cutover and burnt lands. He sent hundreds of letters to the newspapers. Scores of businessmen and writers were on his mailing list. Advertising space in newspapers and magazines was bought at full rates and filled by high-priced copywriters. Starting in 1920 substantial cash prizes for essays were offered once a year.

It has been conservatively estimated that Barnjum spent over $50,000 a year from 1920 to 1933 striving to awaken public conscience. He purchased large tracts of forests in various parts of Canada which were to be public domain forever. For example, in British Columbia he bought 2,300 acres of giant trees in 1931 and 1932. Included in his Nova Scotia purchases were 89 acres, now the Pine Grove Park near Liverpool, as well as 13,200 acres in Annapolis County and 1,300 acres in Victoria County. The last acquisition included beautiful 38-acre Kidston Island, at Baddeck. He spent over $250,000 buying forests in Canada and probably more in the United States. All told, it was estimated that his campaign cost him around a million dollars.

To administer the woodlands he purchased, he set up the Barnjum Forest Foundation. They were supposed to be protected and uncut forever. When he died in 1933, however, he left no provision to transfer his forests to any public trust. His inheritors sold them to lumbermen and pulp and paper manufacturers. The Barnjum Forest Foundation was dissolved and Barnjum's million-dollar dream faded away.

Originally a resident of Annapolis Royal, he became a most successful dealer in timberlands. Just what his position was concerning the "Big Lease" of some 620,000 acres in Inverness and Victoria counties is not known, but evidence presented at the court hearing for the expropriation of the portion of the "Big Lease" taken for the Cape Breton Highlands National Park showed that he had sold the lease to the president of Oxford Paper Company at a profit of one million dollars.[51] He had also profited considerably from his purchase of the 35,000 acres of the Annapolis Lumber Company and the 175,000 acres of the Nova Scotia Central Railway. These were added to holdings of the MacLeod Pulp and Paper Company when he became its president in 1919.

In 1942 Bowater Mersey Paper Company acquired all the Barnjum Forest Foundation lands in Nova Scotia. In 1960, after paying annual taxes of $269.50 to the Municipality of Victoria County for several years, they sold Kidston Island to the Baddeck School Board for the nominal sum of $1,000. This company still owns the Pine Grove Park area near Liverpool and leases it to the Liverpool Lions Club, at a small fee, for public recreational purposes.

AN EARLY SURVEY OF FOREST RESOURCES

THE FERNOW REPORT

Early in 1908, members of the Lumbermen's Association of Western Nova Scotia were pressing for a survey of the forest resources of the province. In 1909 the provincial government arranged with Dr. B. E. Fernow, Dean of the newly established School of Forestry at the University of Toronto, to undertake this survey. A forester in Germany before coming to America, Dr. Fernow was assisted by Dr. C. D. Howe, who later succeeded Fernow as dean, and by J. H. White, a professor at the Toronto school.

The three men, assisted by three forestry students and an experienced "timber looker," carried out the field work over two summers at the cost of $6,000.[70] The report was based on their findings plus information from Provincial Forest Ranger J. B. Whitman, and from many other woodsmen and lumbermen.

The reconnaissance report and forestry maps accompanying the report had to be assembled from the only maps available—Crown land sheets compiled by the Crown Lands Department, apparently in 1908 and 1909, showing land grants and vacant Crown land. In the report Dr. Fernow stated:[70]

> . . . these survey plats are . . . often very inaccurate. . . . The inaccuracies of the surveys are due to two causes: . . . the absence of a system of triangulation or other means of basing new surveys on definitely standard lines . . . and . . . to mistakes, willful or otherwise, of surveyors in the field . . . 100-acre grants were sometimes run to contain 800 acres and more, although recorded and platted on the maps as of the granted acreage.
>
> . . . Theoretically, whatever lands appear on the map sheets not covered by granted locations are supposed to remain in the ownership of the Crown; but since the located surveys in the field, and the plotted surveys on the map often enclose different acreage, the seemingly open lands do not exist, or are not of the size called for.

Originally, the report was supposed to provide separate information for freehold and Crown land; this format, however, had to be abandoned because of boundary survey inaccuracies. Until 1934, when proper boundary surveys were started, these inaccurate maps continued to be the only overall plans of grants and Crown lands.

In the Department of Lands and Forests Annual Report for 1927, Otto Schierbeck as provincial chief forester confirmed Dr. Fernow's findings regarding boundary surveys and grant overruns, stating that ". . . The old Department of Crown Lands has constructed the present Crown Land Maps from those faulty surveys. . . . The results are that our Crown Land Maps are in very poor shape."[68]

Regarding distribution of tree species Dr. Howe wrote:

> . . . the three important conifers, while they occur everywhere, exhibit more or less localization. . . . Annapolis County can be called the hemlock region, this species forming 60 to 70 per cent of many of the uncut stands. The interior of Digby also is largely hemlock country while the shore lands are spruce country, this species forming. . .75 per cent of the forest. Shelburne and parts of Queens are largely pine country while Cape Breton Island is a veritable fir country.[70]

Dr. Fernow also made the following statement: ". . . It is worth noting that many of the small owners treat their woodlots with care, cutting to a diameter limit in selection, and even 'downing the brush."[70] His recommendations included the following: "erection of fire towers, permits for setting fires in the woods, lopping tops of felled trees, the burning of brush, proper organization of a fire fighting force and railways be liable for fires they start." Interestingly, a Forest Fire Legislation Committee of the Canadian Forestry Association later issued much the same advice.

LAND CLASSIFICATION

The Fernow Report on the forest conditions of Nova Scotia is extremely good considering that it cost only $6,000; there are, however, numerous errors in land classification. The maps accompanying the report show far more barren and farmland than there could possibly have been in 1910, even though "farms" included those which had been abandoned and had reforested. The most glaring errors are found in Richmond and Cape Breton counties. The map shows practically all of the areas indicated as Crown land on the Crown land sheets as being barren, with the adjoining freehold lands either being severely culled stands or young growth. In most cases, the boundaries of the barrens are identical with those of the Crown lands. Actually, in most areas, there was little or no difference in the forests on the Crown land and on the freehold land. In 1928 many parts of the Crown lands bore spruce and fir pulpwood averaging from 10 to 20 cords per acre in even-aged stands about 60 years old in 1928. According to Fernow's land classification, most of these areas should have been shown as "young growth."

As of 1910, Fernow's land classification of the entire province was as follows:[70]

Land Class	**Acres**
Softwood	1,905,879
Mixedwood	4,166,591
Hardwood	526,824
Cleared	2,270,304
Recent burn	557,978
Old burn and barren	2,434,930
Meadow	21,680
Bog	37,793
Unclassified	158,240
Total	12,070,219

In this table, the softwood class is 75-100 per cent softwood: mixedwood, 25-75 per cent softwood and the hardwood class, less than 25 per cent softwood. The forest types include Fernow's classifications of "Virgin and moderately culled, severely culled, second growth and young growth."[70]

YIELDS

There was no systematic cruising but Fernow made the following estimate of the standing timber in 1910: coniferous timber on the mainland, 8,624.6 million board feet; spruce and fir pulpwood,

Mainland	10,000,000 cords
Cape Breton	14,000,000 cords
Total pulpwood	24,000,000 cords

This amounts to a total of about 29,000,000 cords-equivalent of softwood on the mainland and 14,000,000 cords in Cape Breton. The hardwood was described as being of "mediocre development" and his guesstimate of the total hardwood is summarized at 33,000,000 cords.

His report also includes the following statements on forest production in Nova Scotia in 1970,[70] from Bulletin 25, Forestry Branch, Department of the Interior:

LUMBER PRODUCT OF NOVA SCOTIA, 1910

Species	Thousand Board Feet	Total Value	Average per Thousand Board Feet
CONIFERS			
Spruce	161,998	$2,133,311	$13.17
Hemlock	52,211	540,025	10.34
White Pine	25,432	385,669	15.16
Balsam	4,938	58,101	11.77
Red Pine	2,843	38,586	13.57
Jack Pine	1,040	10,944	10.52
Tamarack	153	1,692	11.06
Total	248,615	$3,168,328	$12.74
HARDWOODS			
Birch	8,110	$ 101,212	$12.48
Beech	1,950	25,258	12.95
Maple	598	7,456	12.47
Oak	490	11,145	22.74
Ash	252	5,254	20.85
Poplar	192	7,220	37.60
Elm	30	1,161	38.70
Total	11,622	$ 158,706	$13.66
GRAND TOTAL	260,237	$3,327,034	$12.78

TOTAL FOREST PRODUCTS OF NOVA SCOTIA, 1910

Product	Quantity	Value
Lumber	260,237,000 ft.	$3,327,034
Lath	47,712,000 pces.	111,421
Shingles	23,878,000 pces.	36,008
Pulpwood	29,606 cords	135,965
Mining timber	15,653 lineal ft.	168,142
	3,282,000 ft. saw timber	45,281
Cooperage stock (1911)	38,173,000	332,877
Hemlock Bark (1909)	4,600 cords	32,375
Total		$4,189,103

In this table, the average pulpwood value is $4.59 per cord and hemlock bark $7.04 per cord. Unfortunately, respective locations are not given for these values but one presumes the lumber values to be for sawn lumber at mills, the pulpwood value for four-foot wood, not debarked, delivered at pulp mills and that the hemlock bark is bark delivered at tanneries. The purchasing power of the Canadian dollar in 1910 was more than seven times its 1975 value.

Fernow stated that the total cut of 29,606 cords of pulpwood in 1910 was manufactured into pulp in the province.[70] The pulp companies operating at that time were the Nova Scotia Wood Pulp and Paper Company at Charleston, Queen's County, the MacLeod Pulp Company at Milton, the Morgan Falls Pulp Company at New Germany, the St. Croix Paper Company at Hartville, Hants County, the Sissiboo Pulp & Paper Company at Weymouth, Digby County, the Summit Pulp and Paper Company at Harmony, Queens County and the Clyde River Pulp Company at Clyde River, Shelburne County.

Fernow's report also included this statement: "If the whole green forest of Nova Scotia of, say, six million acres, were managed like the Prussian government forests, an annual cut of more than twice the present one could be had forever."[70] He also recommended that the government establish a technically educated provincial forester and that forest legislation be introduced patterned after Sweden's. This turned out to be remarkably similar to the original part (Sections 9, 10 and 11) of the Forest Improvement Act, passed by the Legislative Assembly of Nova Scotia in 1967.[70]

It is instructive to examine some of Fernow's findings in light of recent observations, many of which confirm his speculations. Fernow's report stated that of the roughly 13,000,000 acres of land area of Nova Scotia, bog or muskeg comprised about 500,000 acres, rock barren 157,000 acres and marsh probably 33,000 acres. Today, alders and brush cover nearly 370,000 acres, but it is likely that most of this brushland was originally forest and that the original forest area must have been close to 12,000,000 acres. Probably 5 per cent or 600,000 acres of this is today wooded swamp of low productivity.

The soils that have good drainage and which are more than a few inches in depth can support good forest growth. This includes about 5,000,000 acres now considered by the Nova Scotia Department of Lands and Forests to be suitable for some sort of agriculture. The balance of approximately 6,400,000 acres (which excludes the swamp acreage) is too rocky or too stony for agriculture but quite suitable for good forests. Even where there are numerous large boulders, forests grow well if the soil is deep enough between them. Large red spruce trees have been found standing on top of boulders extending two or more feet above the ground, with the roots of the trees reaching down the sides of the boulders into the soil.

Fernow was particularly interested in Nova Scotia's barren lands. There are three large areas of rock barrens in Nova Scotia. One of over 75,000 acres is situated where the counties of Digby, Yarmouth, Shelburne and Queens join. Another comprises part of the peninsula between St. Margaret's Bay and Halifax Harbour, and the third is a large part of the Canso peninsula between Chedabucto Bay and the Atlantic Ocean, comprising nearly 200 square miles according to Dr. C. D. Howe.[70] The underlying rock on all three areas is granite.

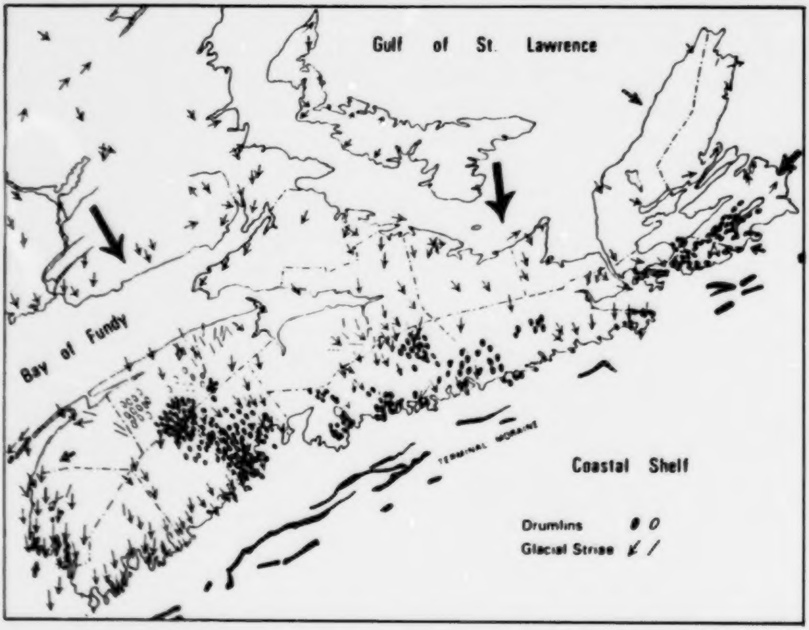
R. M. Strang commented in 1972 on the western Nova Scotia barren: "The coarse, infertile soil is characterized by a massive pan layer which restricts rooting to within a few centimetres of the surface and is impervious to water movement. The highly acidic mineral soil is overlain by a thick organic mantle. . . ."[85] The vegetation is mostly heath, mainly huckleberry, rhodora, sheep laurel and blueberry. There are widely scattered small clumps of short scrubby trees, mostly white pine, in some of the depressions where there is good drainage. Numerous huge boulders, some looking almost like houses at a distance, lie on this barren area. Strang also noted that, "Although fire is undoubtedly a potent factor in maintaining the shrub cover, pollen analyses indicate that an open woodland developed many centuries ago in response to the soil conditions and the prevailing climate. The present shrubby vegetation is thus an expression of inherent site factors as well as of the effects of burning."[85]

Apart from repeated fires, it appears that the poor soils of this western Nova Scotia area could be the result of glaciation overriding an earlier till or scraping off the upper soil layers while simultaneously compacting the residual uppermost stratum. The forests surrounding this barren are poorly developed, with irregular stocking and poor growth. The tree species include balsam fir, white pine, red pine, black spruce, white birch, poplar and red oak; sheep laurel and other heath plants comprise most of the ground cover.

According to J. W. L. Zehatmayr this barren is unique: "Nowhere are there boulder-strewn, rolling tracts underlain by a massive hardpan such as those of western Nova Scotia." However, C. D. Howe and R. M. Strang mention the Guysborough (Canso) barrens as being similar but with soil that is not so coarse. And the barren on the peninsula west of Halifax Harbour appears to be quite similar, although Howe wrote that this is simply a fire barren. Jack pine does occur on both of these barrens, reaching only a few feet in height.

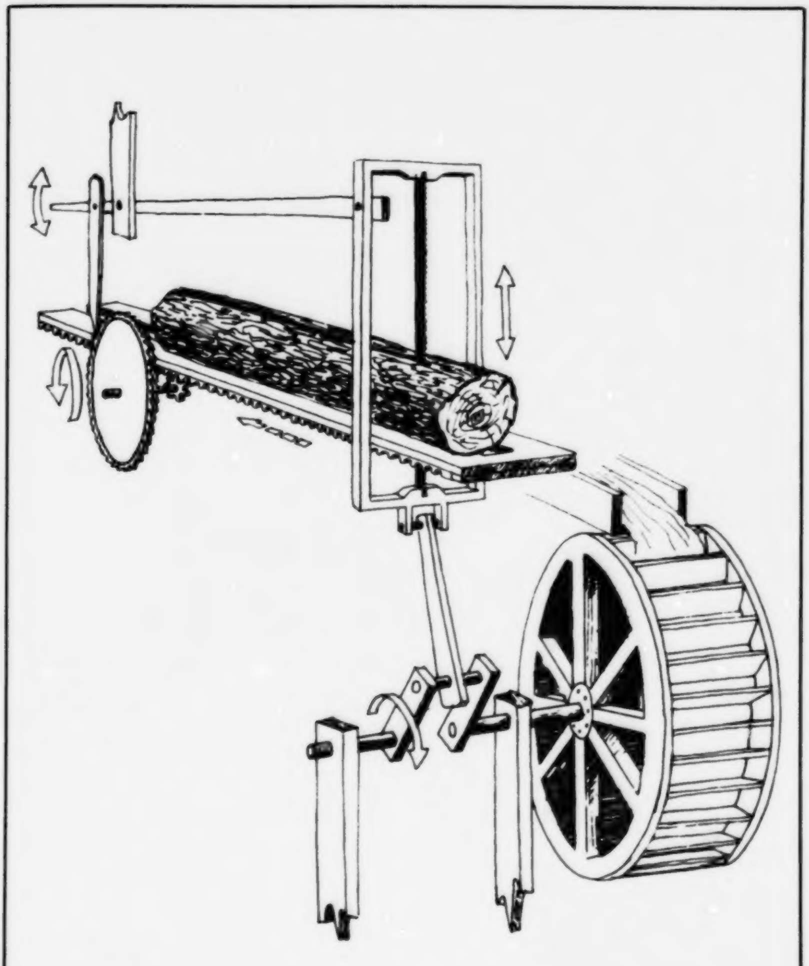
Barrel making was a small but important Nova Scotia industry until the early 1950s.

Courtesy of R. Merrick, Education Media Services, N.S. Department of Education.


Gulf of St. Lawrence
Bay of Fundy
Coastal Shelf
TERMINAL MORAINE
Drumlins
Glacial Striae

The distribution of drumlins and terminal moraines in Nova Scotia, and of glacial grooves and Striae in the Maritime Provinces are shown above. The heavy arrows suggest major ice advances. Drumlins indicated by open symbols contain granite boulders.

Courtesy of N. S. Institute of Science



Operating principle of an up-and-down sawmill: A crank, driven by the waterwheel, moves the saw frame and single saw blade in an up-and-down motion cutting into the log on each downward stroke. The up-and-down motion of the saw frame is also used to move the log carriage forward by means of a system of levers and a ratchet.

Courtesy of Nova Scotia Museum

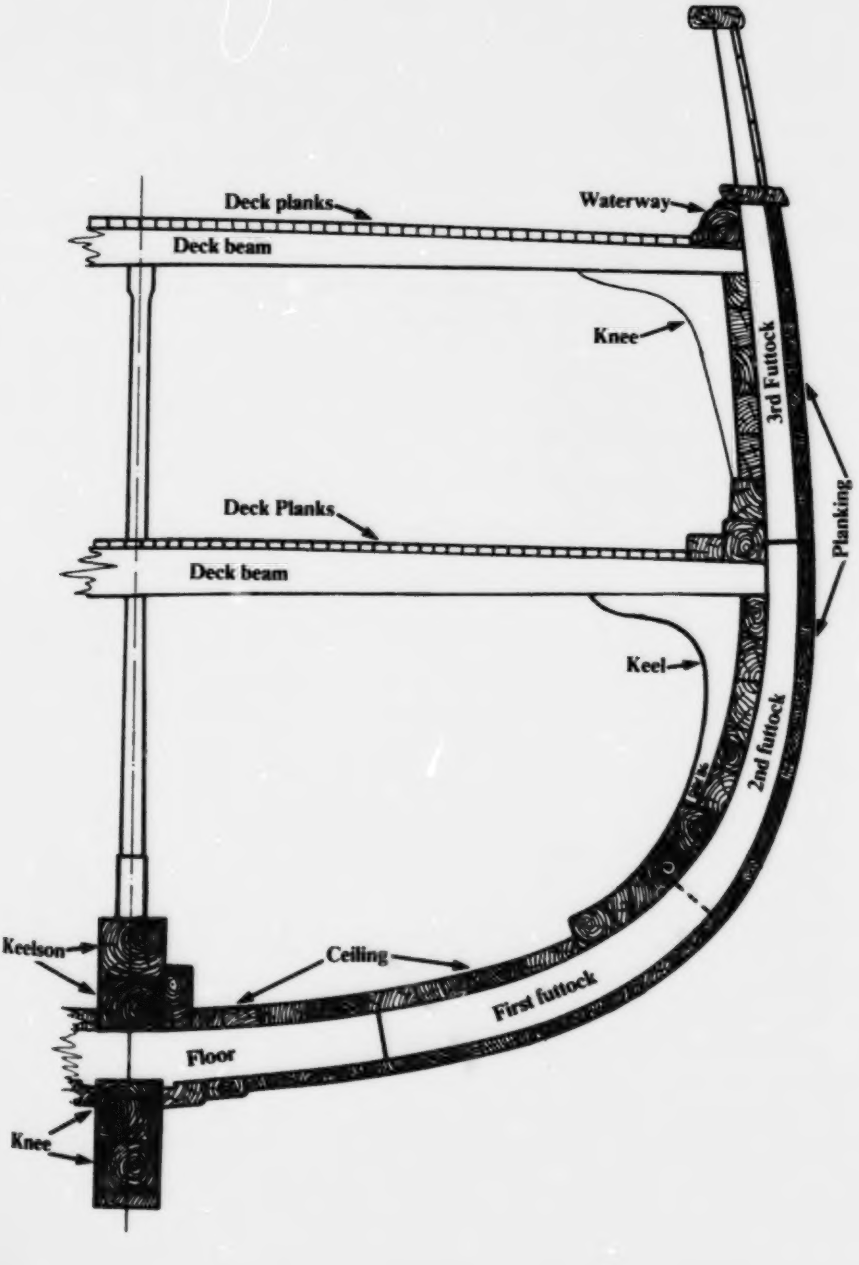
TYPICAL MIDSHIP SECTION of a NOVA SCOTIAN BUILT VESSEL of about 800 tons in the MID NINETEENTH CENTURY

Source: Drawing — Nova Scotia Registry of Shipping: with Standard Rules and Construction and Classification.
Compiled by: Thos. R. De Wolf, 1866
Wood Species: Maritime Museum of the Atlantic/Public Archives of Canada — Lloyd's Survey Reports of Nova Scotian Built vessels.

Location or Description	**Wood Species**
Keel	Birch
Keelson	Spruce or Tamarac
Floor	Birch
First futtock	Birch, Spruce or Tamarac
Second futtock	Birch, Spruce or Tamarac
Third futtock or top timber	Spruce or Tamarac
Planking: Garboard & bottom	Birch
Bottom to deck	Birch, Tamarac or Spruce
Ceiling: Lower part	Birch
proceeding upwards	Tamarac & Spruce
Knees	Tamarac or Spruce
Deck beams	Spruce, Birch or Tamarac
Deck planks	Pine or Spruce
Waterways	Pine

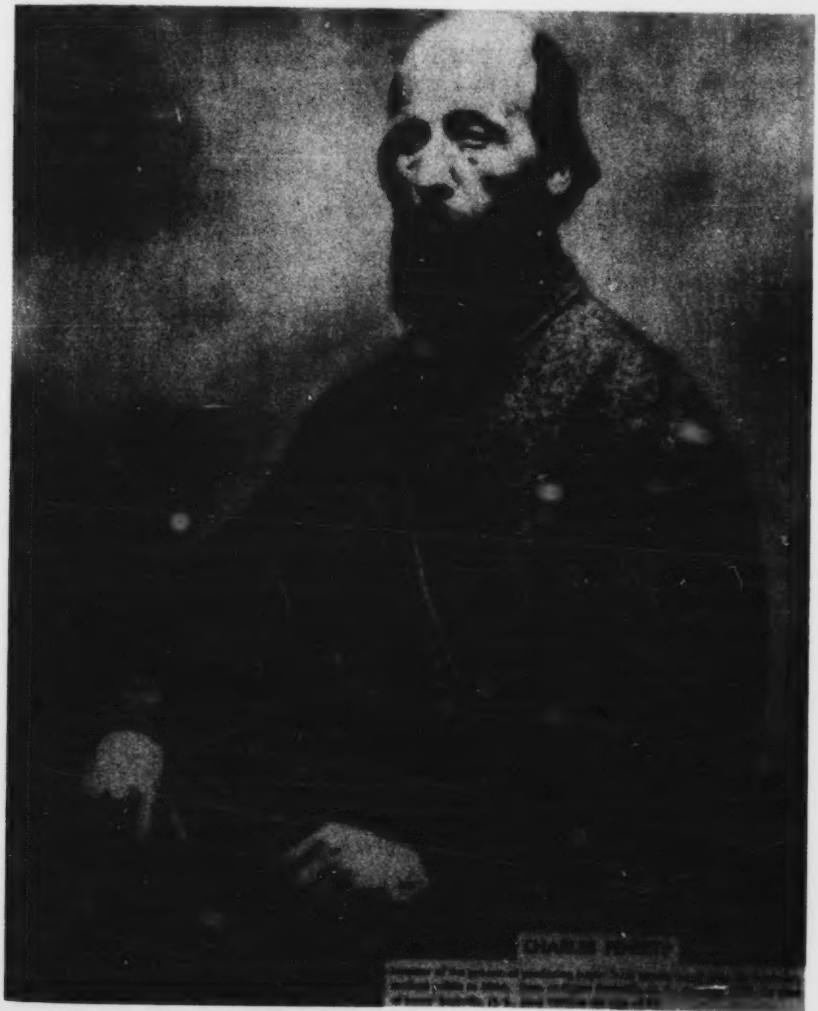
Note: The above species are listed as being the most common used on the 49 survey reports for vessels built in Nova Scotia between the years 1864-65
The second or third species listed are in diminishing order of frequency of use.

David A. Walker


Deck planks
Waterway
Deck beam
Knee
3rd Futtock
Planking
Deck Planks
Deck beam
Keel
2nd futtock
Keelson
Ceiling
First futtock
Floor
Knee

This reconstruction of MacDonald Brothers' sawmill at Sherbrooke Village, Guysborough County shows the operation of a waterwheel which is 12 feet in diameter, four feet wide and contains 32 buckets. Water is forced on the flume and is contained in the buckets by the apron at the back. The water expels at the bottom of the wheel. This wheel will achieve a maximum of 35 revolutions per minute.

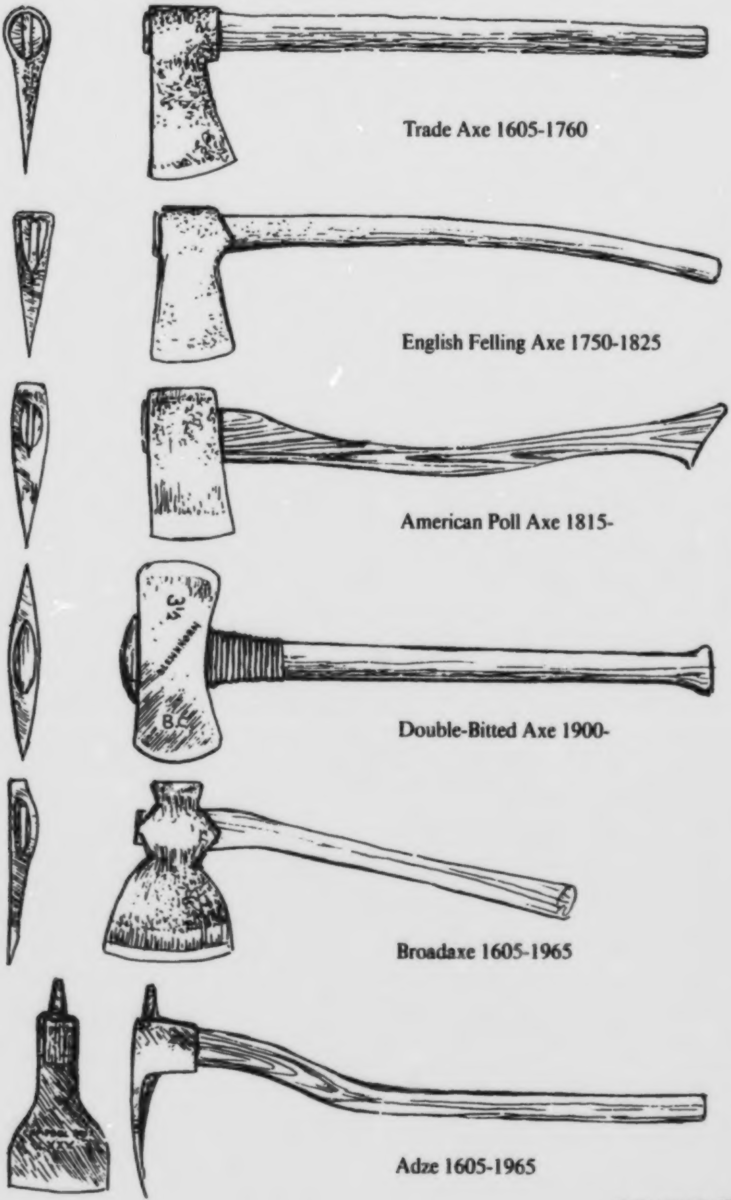
Courtesy of Nova Scotia Museum


CHARLES FENERTY

Charles Fenerty of Lower Sackville — inventor of producing paper from groundwood pulp.

Courtesy of Public Archives of N. S.

Axes Used in Nova Scotia



Trade Axe 1605-1760

English Felling Axe 1750-1825

American Poll Axe 1815-

Double-Bitted Axe 1900-

Broadaxe 1605-1965

Adze 1605-1965

R.H. Wyllie '85

A Queens County jobbers crew with oxen (circa 1900).

Collection of R. S. Johnson

Sutherland Steam Mill, New Denmark (1900) (before restoration by Nova Scotia Museum).

Courtesy of Nova Scotia Museum

Liverpool and Milton Transit Company train (1899).

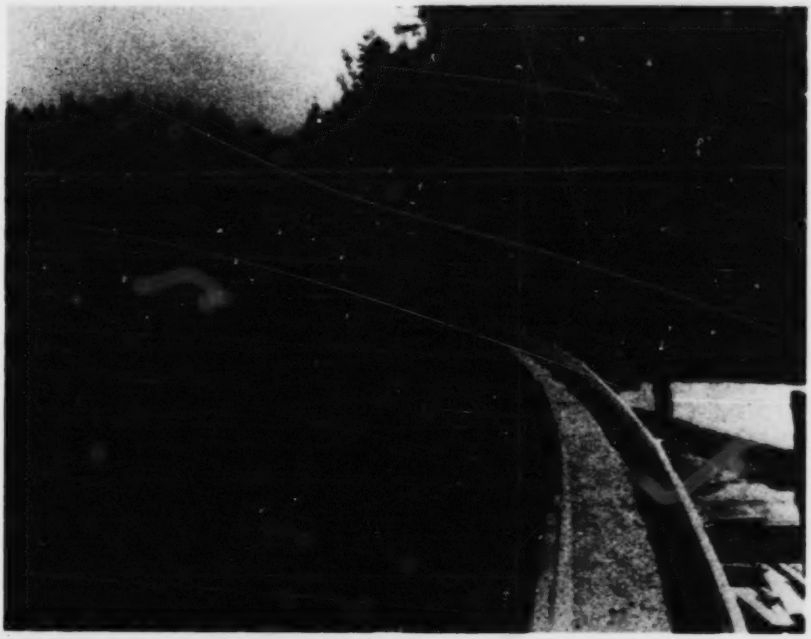
Collection of R. S. Johnson

Liverpool and Milton Transit Company train, after passenger superstructure removed (1900).

Collection of R. S. Johnson

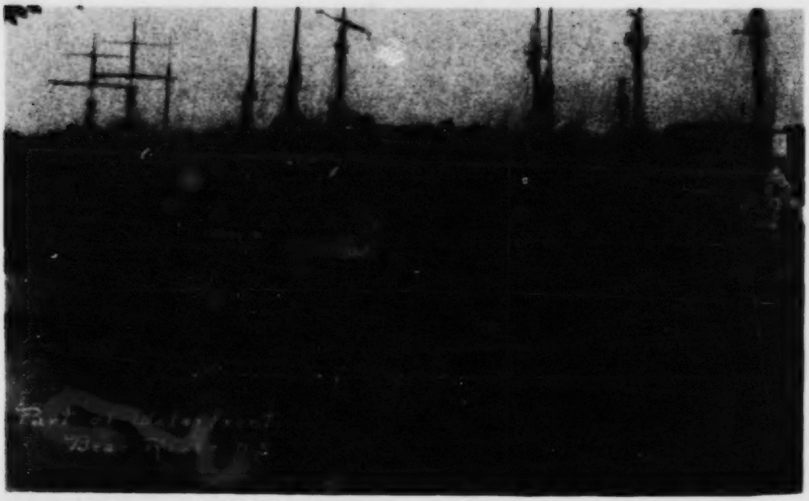
T. G. McMullen's bridge over ravine at Farm Lake near Tatamagouche. Note that bridge is built around living trees (tops cut off).

Collection of R. S. Johnson



T. G. McMullen's flume at Tatamagouche Mountain.

Collection of R. S. Johnson


Part of waterfront
Bear River N.S.

A bark, barkentine and schooner at Bear River (circa 1900).

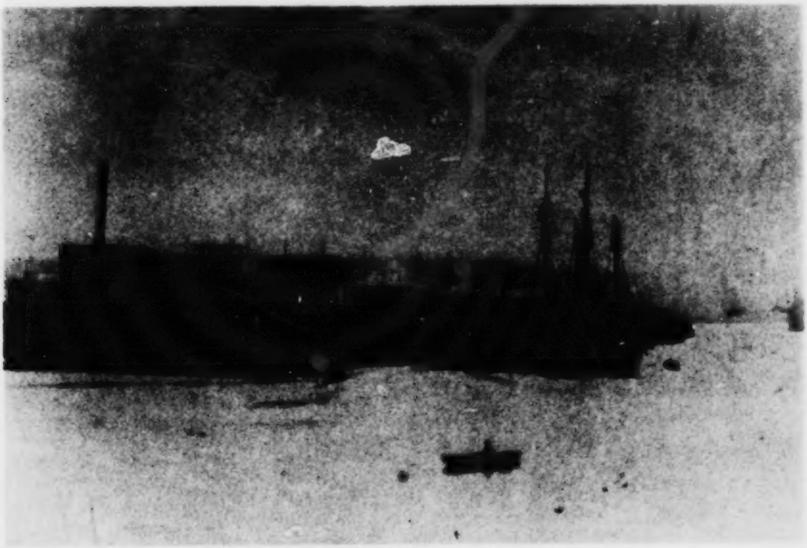
Collection of R. S. Johnson

This Freemans' Mill at Greenfield, Queens County was swept away by Hurricane Edna in 1954.

Courtesy of Harry Freeman

Rhodes-Curry sawmill at West River Sheet Harbour (circa 1900).

Provided by Tom Chisholm



Sulphite mill at East River Sheet Harbour.

Collection of R. S. Johnson

The Milton Pulp Company mill at Rapid Falls, Mersey River (1895).

Provided by Roy Gordon

Pulpwood in Mill Yard

Pulpwood at the Charleston pulp mill.

Provided by Roy Schofield

The Charleston pulp mill (1930).

Provided by Roy Schofield

Pulp mill at Weymouth

Collection of R. S. Johnson

Shingle mill at Brooklyn, Queens County (circa 1900). Note piles of shingles at centre.

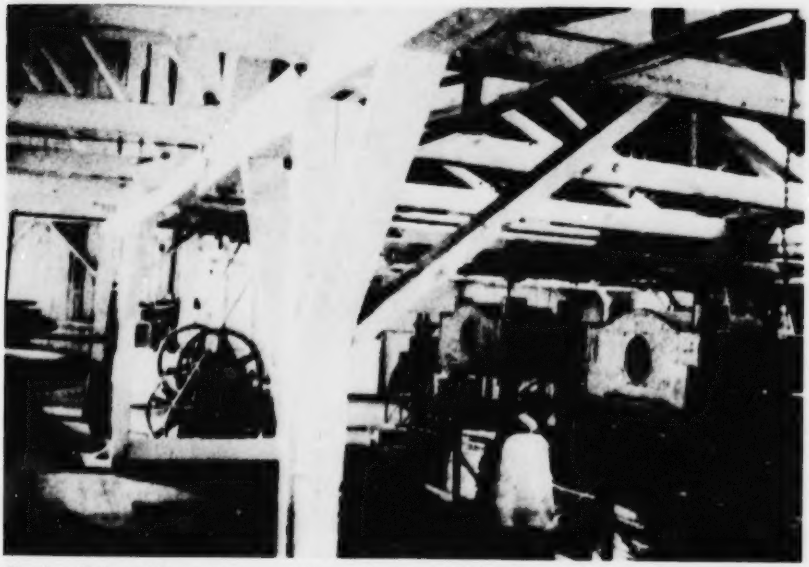
Provided by Mel Gardner

Shingle mill at Brooklyn, Queens County (circa 1911). Note new construction in background.

Provided by Mel Gardner

Sissiboo Pulp and Paper Company Limited, Grand Lake Camp.

Collection of R. S. Johnson

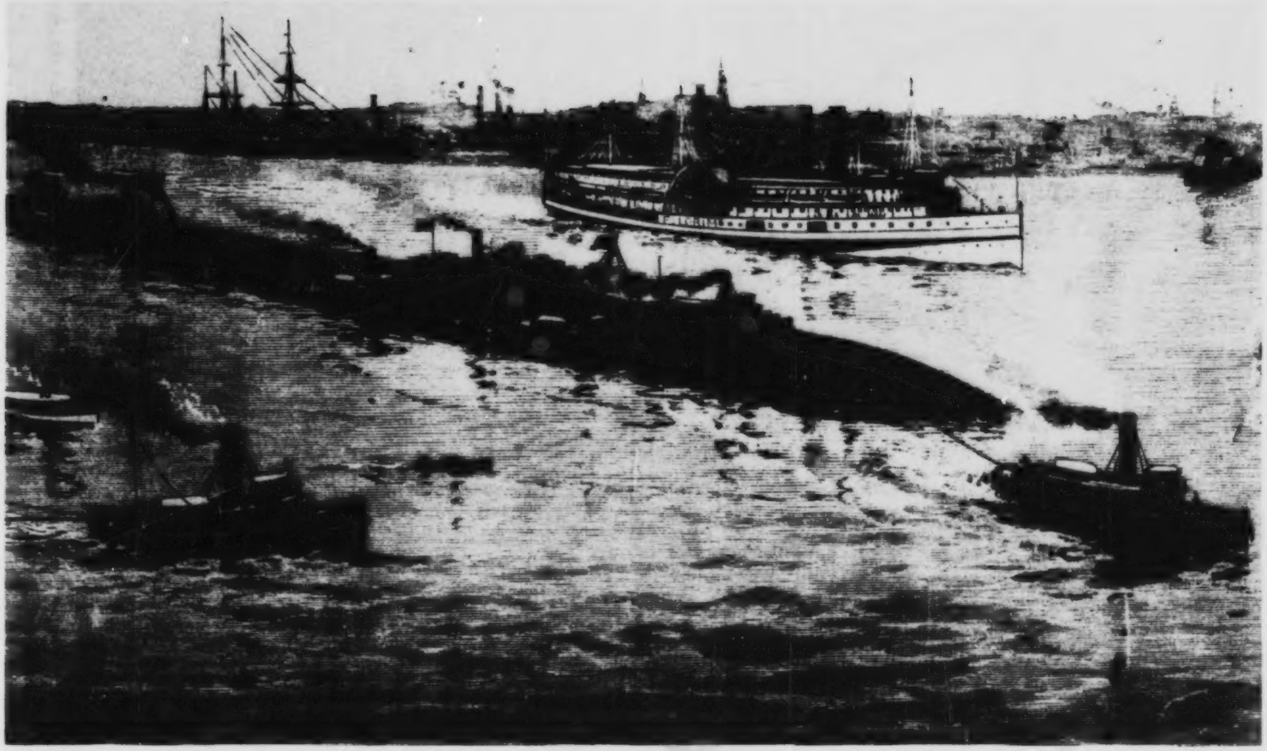


Sissiboo Pulp and Paper Company Limited; Interior of mill at Weymouth Falls showing hydraulic presses, pumps and ends of wet machines.

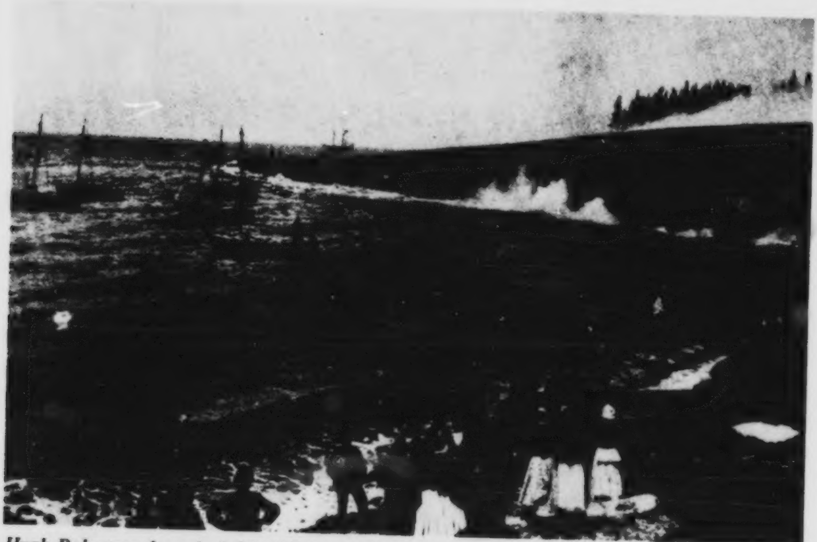
Collection of R. S. Johnson

Sissiboo Pulp and Paper Company Limited: Downriver view of mill at Weymouth Falls with spur line and locomotive in distance.

Collection of R. S. Johnson



After an 11-day voyage, the "Joggins raft" arrived in New York harbour. The engraving shows the appearance of the great raft during its progress down the East River.



Hugh Robertson launched this 600-foot raft at Fingerboard Beach, near Joggins, Cumberland County in August, 1888. It contained 22,000 logs and weighed 15,000 tons.

Courtesy of Nova Scotia Museum

A-frame log loading on early operations of Davison Lumber Company (1905).

Collection of R. S. Johnson

NORTH RIVER LUMBER CO
MURRAY C B
1905

Employees of North River Lumber Company in Murray, Cape Breton 1905. As remembered by Mrs. George Hamm: Bottom Row (read left to right): Murdock MacDonald, John MacKenzie, Murdoch D. MacDonald, John MacDonald, John J. Matheson, John Morrison, Phillip MacDonald, Norman MacLeod; 2nd Row (left to right): John MacLeod, Rory Kerr, William D. MacDonald with Simon MacDonald behind, John Kerr, Malcolm MacDonald, Murdoch Peggy MacLeod, Sandy MacLennan, Donald MacDonald. 3rd Row (right to left); Donald MacRitchie with beard, Alex Montgomery, Malcolm MacAulay, Murdoch MacDonald, John MacLeod, Murdoch J. MacDonald, Murdoch Morrison, Murdoch Montgomery; Top Row (left to right): John J. MacDonald, Malcolm MacRitchie, John MacAskill, Angus Kerr, and a Pentecost man from away.

Provided by Carl Hamm

James Davis, scaler, at Davison Lumber Company logging camp at Shell Lake Camp #5 office (1909).

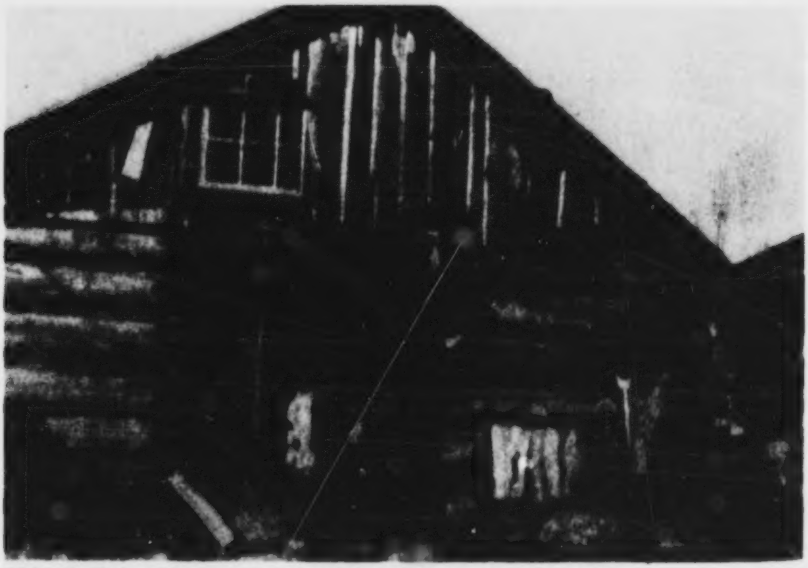
Collection of R. S. Johnson

Portion of crew at Shell Lake Camp #5 (1909).

Photo by Wilbur B. Sherrard. Collection of R. S. Johnson

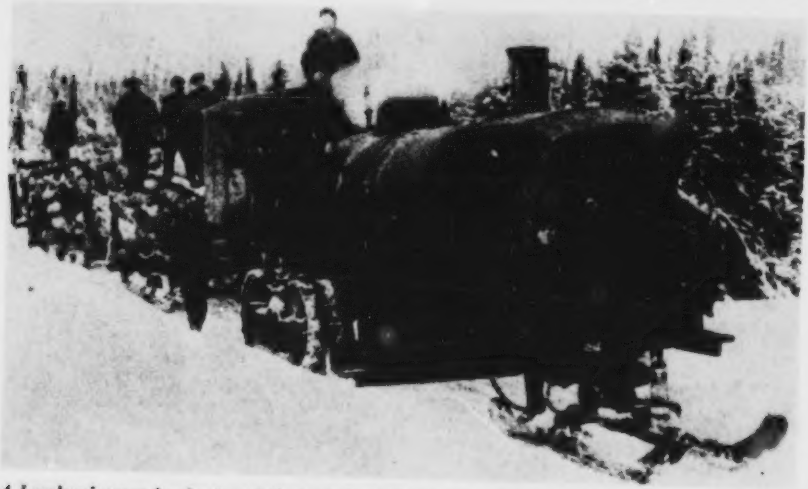
Horse and ox teams and crew preparing a new skid pile at Shell Lake Camp #5 (1909).

Photo by Wilbur B. Sherrard. Collection of R. S. Johnson



Wilbur B. Sherrard, foreman, in front of Shell Lake Camp #5 office (1909).

Collection of R. S. Johnson



A Lombard steam hauler (not fully loaded) similar to one used by Davison's Lumber Company. (Price Brothers' hauler in Quebec, 1916).

Provided by Nelson F. Douglas

Cottages at Hastings mill.

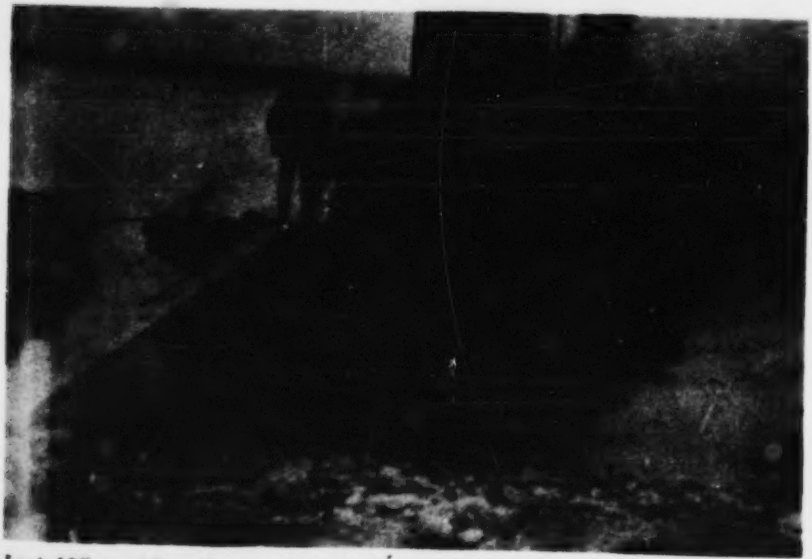
Provided by Nelson F. Douglas

Lewis Miller and Sons Company Limited: North end of mill showing jack ladders (1923).

Collection of R. S. Johnson

Lewis Miller and Sons Company Limited: Drivers working on the sluice boom at Snake Lake (1923).

Collection of R. S. Johnson



Lewis Miller and Sons Company Limited: An "alligator" showing cable, roller and anchors on deck. Ralph S. Johnson is shown far left on deck (1923).

Collection of R. S. Johnson

MacLeod Pulp and Paper Company pulp mill at Rapid Falls (1926).

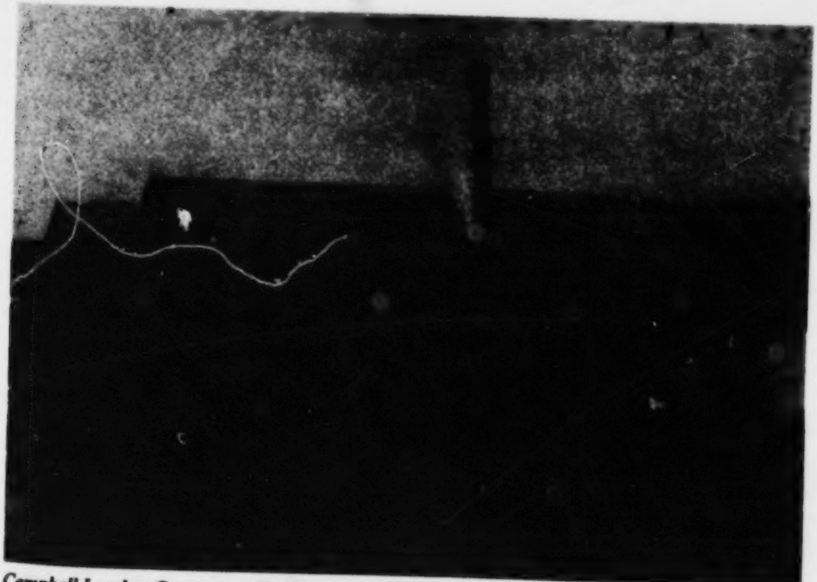
Provided by J. A. Parker

MacLeod Pulp and Paper Company pulp mill at Rapid Falls (1926): Wood room and boiler house.

Provided by J. A. Parker

MacLeod Pulp and Paper Company pulp mill at Rapid Falls (1926): Debarked two-foot bolts of pulpwood.

Provided by J. A. Parker



Campbell Lumber Company mill at Weymouth Falls (1907).

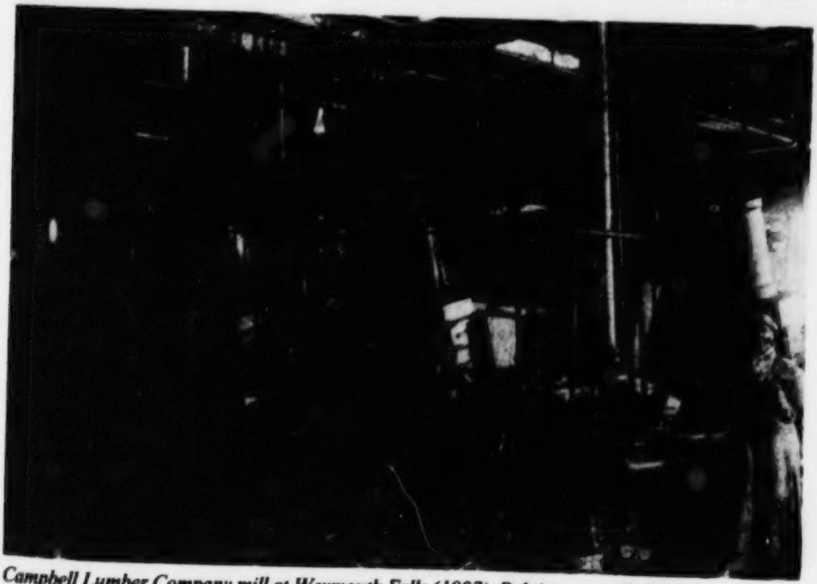
Provided by Gifford Lewis

Campbell Lumber Company mill at Weymouth Falls (1907): Filing room.

Provided by Gifford Lewis

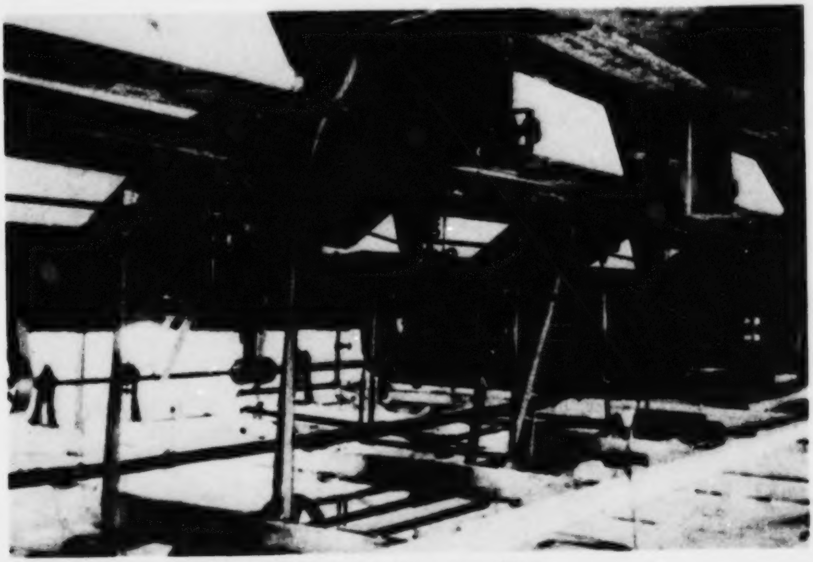
Campbell Lumber Company mill at Weymouth Falls (1907).

Provided by Gifford Lewis



Campbell Lumber Company mill at Weymouth Falls (1907): Pulping sawmill slabs.

Provided by Gifford Lewis



Clyde Pulp Company Limited mill interior showing wet machines.

Collection of R. S. Johnson

Unloading the steamer "Liverpool Rover" at the Mersey boom.

Courtesy of Bowater Mersey Paper Company

Mersey Paper Company: Peeled hemlock pulpwood at Boot Lake, Shelburne County (1938).

Collection of R. S. Johnson

Mersey Paper Company: Boot Lake flume to Little Tobeatic Lake.

Collection of R. S. Johnson

Mersey Paper Company: Tern schooner "Whiteway" with pulpwood below and on deck at Mersey dock (1930).

Courtesy of Bowater Mersey Paper Company

Mersey Paper Company: Four-masted schooner at Mersey mill boom.

Courtesy of Bowater Mersey Paper Company

1

2

3

1 *Pulpwood operations in Cape Breton: Wood piled along truck road ready to be hauled to the ice (1938).*

Courtesy of N. S. Department of Lands and Forests

2 *Pulpwood operations in Cape Breton: Trucks and sled trailers haul direct to the ice at loading point (1938).*

Courtesy of N. S. Department of Lands and Forests

3 *Pulpwood operations in Cape Breton: Dry log chute provided shortcut down steep hillside.*

Courtesy of N. S. Department of Lands and Forests

Pulpwood from a local fisherman's woodlot delivered by sled and oxen at Mersey Paper Company wood yard (1929).

Collection of R. S. Johnson

Cutting pulpwood with crosscut saw.

Provided by Jack Dunlop

Mersey Paper Company: Cook frying doughnuts at logging camp.

Courtesy of Bowater Mersey Paper Company

Logging operation in Hants County (1930s).

Courtesy of Earle Burton

Sap-peeling hemlock.

Courtesy of Bowater Mersey Paper Company

Loading sled with logs from a brow.

Courtesy of Bowater Mersey Paper Company

Truck dumping logs into river.

Collection of R. S. Johnson

Scott Maritimes Limited pulp mill at Abercrombie, Pictou County (1966).

Courtesy of Scott Maritimes Ltd.

Nova Scotia Forest Industries (now Stora Forest Industries) mill at Point Tupper, Inverness County (1961).

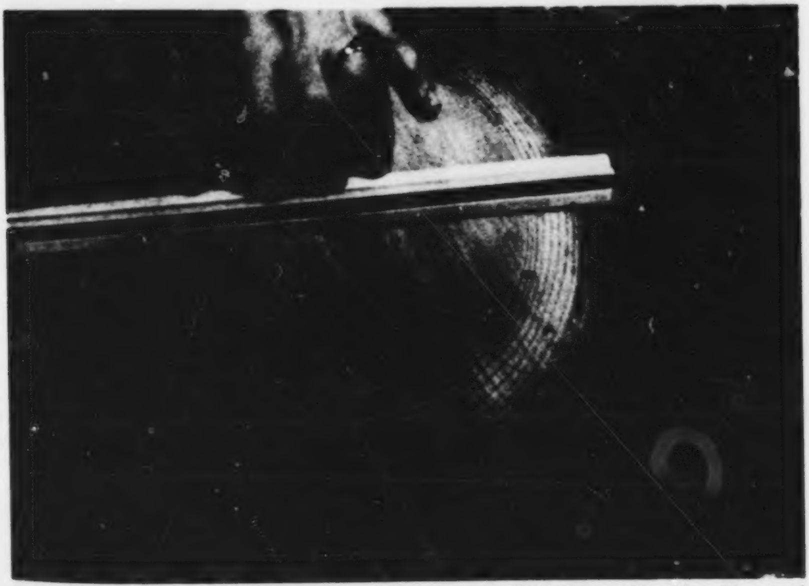
Courtesy of Stora Forest Industries

Mature spruce/pine/hemlock forest in Western Nova Scotia undisturbed for more than 30 years

Collection of R. S. Johns

A 75-year-old red spruce stand following selection cut.

Collection of R. S. Johnson



Stump of red spruce cut in 1959 following selection cut in 1947. Note width of last 10 annual rings.

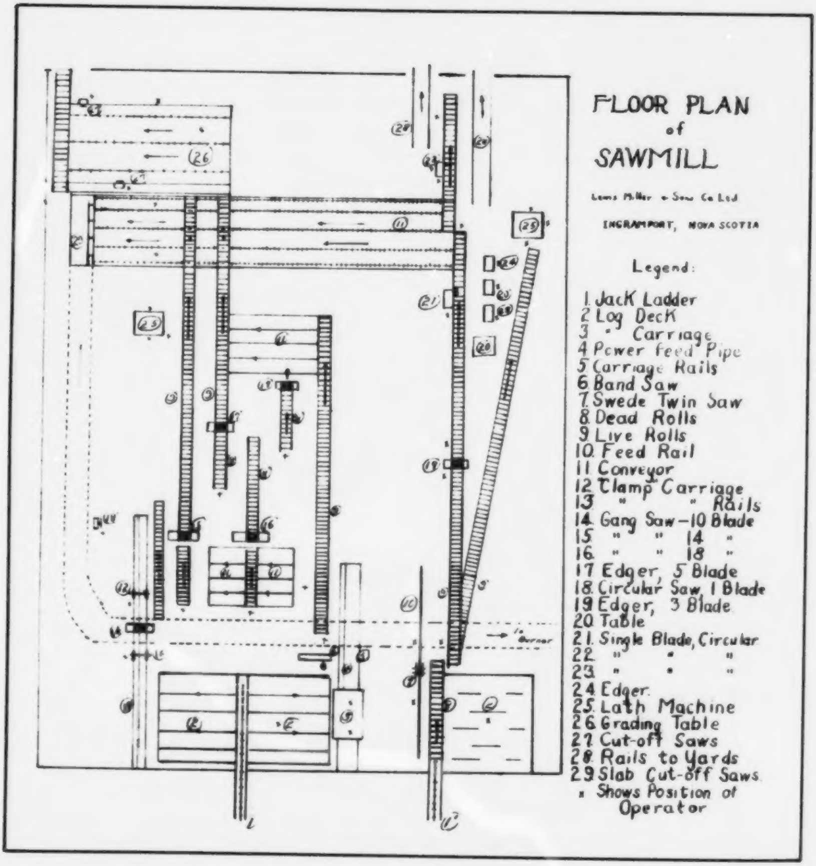
Collection of R. S. Johnson

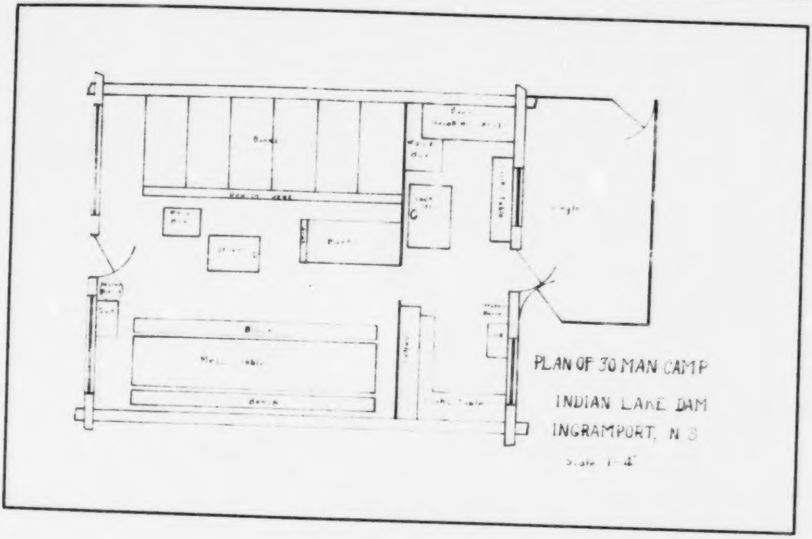
A successful shelterwood cutting of white pine with young regeneration on the Pack Demonstration Forest, Warrensburg, N. Y. U. S. Forest Service.

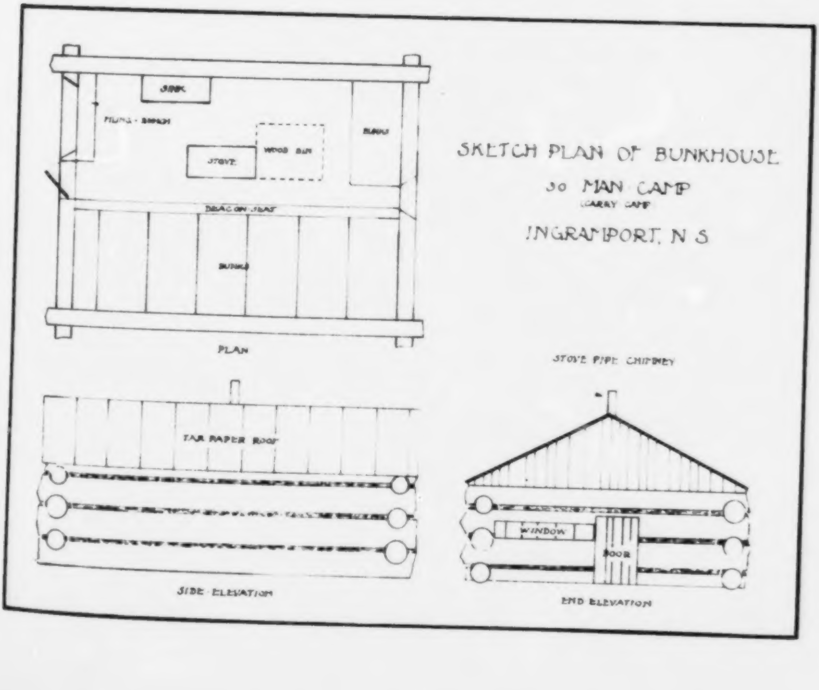
Collection of R. S. Johnson

A group selection system of silviculture brought about this white pine stand for the future. Note the different age classes, small seedlings in foreground. U. S. Forest Service.

Collection of R. S. Johnson


FLOOR PLAN
of
SAWMILL
Lewis Miller & Sons Co Ltd
INGRAMPORT, NOVA SCOTIA
Legend:
1. Jack Ladder
2 Log Deck
3 " Carriage
4 Power Feed Pipe
5 Carriage Rails
6 Band Saw
7. Swede Twin Saw
8. Dead Rolls
9 Live Rolls
10. Feed Rail
11 Conveyor
12 Clamp Carriage
13 " " Rails
14. Gang Saw – 10 Blade
15 " " 14 "
16 " " 18 "
17 Edger, 5 Blade
18. Circular Saw, 1 Blade
19 Edger, 3 Blade
20 Table
21. Single Blade, Circular
22 " " "
23 " " "
24 Edger.
25. Lath Machine
26 Grading Table
27 Cut-off Saws
28 Rails to Yards
29 Slab Cut-off Saws
x Shows Position of Operator
To Burner
26
11
25
29


Bunks
Bench
Mess table
PLAN OF 30 MAN CAMP
INDIAN LAKE DAM
INGRAMPORT, N.S
Scale 1"=4'


SINK
FILING BENCH
STOVE
WOOD BIN
DEACON SEAT
BUNKS
PLAN
SKETCH PLAN OF BUNKHOUSE
30 MAN CAMP
(CARRY CAMP)
INGRAMPORT, N.S
STOVE PIPE CHIMNEY
TAR PAPER ROOF
SIDE ELEVATION
WINDOW
DOOR
END ELEVATION

8 THE TWENTIETH CENTURY: 1931-1950

The economic seesaws of the Depression and the Second World War further tested the mettle of Nova Scotian timber and paper producers. Adding to the woes of many were highly discriminatory land taxes which were to obtain for 30 years. Some companies did well, though, contributing to the economy and to the war effort. The addition of the Maritime Lumber Bureau grading system to exported timber did much to brighten the economic picture. Further fine-tuning of the Lands and Forests Act and the introduction of the Small Tree Conservation Act—the first legislation aimed at control of cutting on privately owned land— brought a scattered and struggling industry through some of the most trying times of the century.

CHAPTER 34

THE THIRTIES AND THE WAR—AN ECONOMIC SEESAW

LUMBERING AND JOBS

The depression of the thirties started in 1929 but its economic effects were not felt badly in Nova Scotia until 1931. This was largely because of establishment of power developments and of new industries. When it did strike this province, however, it was particularly severe, because the Nova Scotia economy was still based largely on lumbering, fishing, agriculture and coal mining. Lumber production fell as demand decreased, but production remained higher than markets and prices warranted. For many lumbermen and their workmen it became a matter of survival rather than of profits. The value of standing timber became more academic than real and wages dropped to where a man was truly lucky if he could say, at 6:00 p.m., "Another day, another dollar." Lumber prices from 1930 to 1936 averaged about $12.50 per thousand board feet for deals, $10.00 for scantlings and $9.00 for boards—if saleable at all. Many operators were in continual financial difficulties and some went bankrupt. It became the practice to send shipments on consignment to Britain, to be sold over the bargain counter.

Of economic necessity, lumber production was concentrated in the most accessible areas. Generally only good quality lumber of preferred species was saleable. Most medium and low grade logs were left in the woods to rot. Mersey Paper Company bought top quality spruce and fir pulpwood at $3 per cord delivered at roadside for trucking. Woodlands, in holdings of less than 1,000 acres, were purchased for $1 per cord for standing spruce and fir, with no consideration for the value of pine, hemlock or hardwood, nor for the land. Thanks to its ability to obtain low-cost pulpwood and because of the acumen of its president Col. C. H. L. Jones and the financial ability of I. W. Killam, Mersey continued in full operation. Elsewhere the picture was not so bright. In January 1932, the Halifax Power and Pulp Company at Sheet Harbour closed operations, creating unemployment in the area. The Power Commission offered the Halifax Power and Pulp Company power at reduced cost in August 1932, and breakeven operations were renewed. Many industries elsewhere in Nova Scotia reduced production or closed down.

During the depression, lumber production fell from 166,037,000 board feet, produced by 645 mills in 1931, to 67,447,000 board feet produced by 584 mills in 1933, but in 1934 it bounced right back to more than 196 million feet. Local pulpwood consumption dropped from nearly 160,000 cords in 1931 to less than 120,000 in 1933, and pulpwood cut for export went down from 170,000 cords in 1931 to less than 54,000 in 1935. Mine pitprop production, mostly in Cape Breton and in Cumberland and Pictou counties, decreased from about 25,000 cords in 1931 to a minimum yearly production of less than 5,000 cords in 1932. Yet during 1935, one paper mill, four pulp mills and over 500 sawmills produced about 179 million board feet of softwood lumber, 38 million of hardwood, 260,000 cords of pulpwood and a substantial cut of pitprops, railway ties, boxes, barrels, shingles and other material.[69] In 1933 the Scotia Lumber Company had entered a contract with the Maine Seaboard Paper Company at Bucksport, Maine for delivery of 280,000 cords of spruce-fir pulpwood, 60 per cent spruce, at the price of $7.75 per cord for peeled wood and $6.25 for rough wood.[86] About 40,000 cords per year—with 60,000 in one depression year—were shipped until the contract was discontinued in 1941 because of the war.[87]

Dominion (Canada) figures for the fiscal year ending March 31, 1935 showed that Quebec exported 68 million feet of spruce lumber to the United Kingdom, an increase of 26 per cent over that of 1934; New Brunswick exported 105 million, an increase of 11 per cent; and Nova Scotia exported 115 million, an increase of 65 per cent. Thus Nova Scotia took the lead in spruce lumber exports to this important market. During the same period Nova Scotia's spruce exports to the United States totalled less than seven million board feet.[88]

Unemployment continued to be bad into the late 1930s. To help relieve it, the federal government sponsored a national forestry program which the Nova Scotia Department of Lands and Forests partly administered. A number of young men were employed in the Chignecto Sanctuary, motor roads were built, telephone lines were erected, and trees were planted for three successive years. The outbreak of World War II in September 1939 changed the unemployment situation drastically and the national forestry program ended that November.

Forest production also changed greatly as a result of the war. To promote the sale of Maritime lumber, lumbermen of New Brunswick and Nova Scotia, with the financial support of their provincial governments, organized the Maritime Lumber Bureau and sent a representative to the United Kingdom in

1939. However, no lumber grading rules were adopted and there were still many uncertainties regarding sizes, quality and values until after 1942. The war caused European countries to stock large supplies of lumber. Russia applied a quota to its lumber exports and this opened markets for Canadian lumber. During and after the War, lumber prices climbed steadily—from $25 for deals in early 1939 to $40 in 1941, $60 in 1944, $70 in 1946 and $88 in 1951.

Just when increased quantities were needed for the war effort, the German submarine blockade again cut off Britain's traditional source of most of her softwood requirements. In Nova Scotia manpower shortage, rationing, and the use of some obsolete equipment held lumber production back to some extent. Despite this, it again rose to historic heights as Britain looked westward for lumber. In fact, overall forest production continued to increase in Nova Scotia until 1940, when pulpwood exports fell at first to 22,000 cords and then to nil in 1941 and 1942 because of the war. Practically all pulpwood exported from 1943 to 1945 was shipped by rail. Pulpwood for local consumption also decreased from about 212,000 cords in 1934 to 100,000 in 1945.[69] The reduction in consumption of Nova Scotia pulpwood was largely the result of Mersey Paper Company's taking on the repairing and refitting of naval vessels from 1942 to 1945 inclusive.

By 1942 the demand for manpower for the military services and war industries had produced an acute shortage of woods labour in Nova Scotia. Another effect of the war was price control on lumber for Canadian consumption in 1941, followed in 1942 by price ceilings on practically all commodities and services. That year the Wartime Wages and Cost of Living Bonus Order's control of wages was extended to forest industries.

Heavy domestic consumption and the shift in the trend of demand in export markets were outstanding developments in the Canadian lumber trade in 1941 and 1942. Shipments to the United Kingdom declined over 40 per cent from that of 1940 and shipments to the United States increased over 90 per cent. Although Britain needed lumber badly, ships were not available to move all that she required.

In Nova Scotia ceiling prices for spruce and fir pulpwood with bark—not less than 60 per cent spruce—were set in 1942 by the Wartime Prices and Trade Board as follows:

At truck roadside	$6.50
Piled at siding or in buyer's yard	7.50
Free on board railway cars	8.00
Free on board steamships	9.00

Sap-peeled or hand-shaved wood could be up to $2 additional. Ceiling prices for "large operators" (200 or more cords per year) were to be not more than 15 per cent above the fixed prices in the schedule. That year export of pulpwood from Canada was controlled because of serious local shortages. Permits were required for all shipments. The Timber Control Board also set the ceiling price for Maritime white pine logs at $54 per thousand board feet log run, culls out, free on board mills. And the board established a maximum price of $14 per cord of dry hemlock bark, free on board shipping point, in all of eastern Canada. Moveover the cord was to weigh not less than 1,900 pounds nor more than 2,100 pounds.

The Timber Controller of Canada estimated that in 1941 Nova Scotia produced 403 million feet of timber or 7.9 per cent of the Dominion's 1941 production, and New Brunswick, 375 million or 7.4 per cent. According to the Dominion Forecast Service (*The Forests of Canada*, 1935), the total productive forest area of Nova Scotia was 11,950 square miles, or 1.5 per cent of the total for the Dominion, and that of New Brunswick was 21,773 square miles or 2.7 per cent.

On July 1, 1941 the Unemployment Insurance Act became effective in Canada. Under this act all employees of sawmills and other wood-processing plants which operated more than 30 weeks a year, whose earnings were not over $2,000 per year, were insurable. At that time, logging camp employees were still not insurable. As of December 1943, the maximum basic rate of wages for woods and sawmill operations in New Brunswick was $3 per day and in Nova Scotia, $3.90. In addition to these wage rates employers were required to pay a cost of living bonus. This bonus was only 95 cents a week.

To increase fuelwood cutting for the next winter, the Fuel Controller of Canada announced a subsidy of $1.00 per cord for all commercial fuelwood contracted for and out by June 30, 1943 and held to dealers' accounts on that date.

Granted land purchased by the province in 1943 totalled 62,940 acres—the largest acreage purchased in a single year to that time. It was estimated that, including this, the total Crown land was 2,277,247 acres.[69] Twenty-nine Crown land cutting licenses covering 2,355 acres were issued. The stumpage on one 50-acre lot was sold for the lump sum of $2,000 and other stumpage prices ranged from $4 to $8 per thousand board feet.

By this time Christmas tree production had become an important seasonal industry. Most of the trees shipped were balsam fir, but an increasing number of red spruce and red pine were being exported. Many lumbermen opposed the cutting of these species, but export was under the jurisdiction of the federal government and protests did nothing to prevent it. The province solved the problem by enacting legislation requiring commercial Christmas tree buyers to purchase a license that covered only balsam fir. In 1944, 13 Christmas tree buyers' licenses were issued and 1,280,215 trees, making over 600 railway carloads, were exported. The largest buyer shipped 656,728 trees.[69]

OTHER WOOD PRODUCTS

Until the 1950s, apples and potatoes were mostly packed and shipped in wooden barrels. From 1930 to 1939 inclusive this comparatively small but important Nova Scotia industry produced some 1,500,000 barrels and 164 million board feet of staves and headings. Spruce, fir and pine were used. Production fell off in 1940, rose again between 1944 and 1948, and then gradually diminished to almost nothing by 1972.[69] Six million barrel hoops were also produced annually in Nova Scotia. These hoops were mostly gray birch tree stems, an inch or so in diameter, split in two. New Ross, Lunenburg County was the barrel hoop centre. Grey birch was prolific in that part of the province, growing largely on land burned in fires started by the Springfield Railway of the Davison Lumber Company. The price of these hoops in 1930 was $9 per thousand.

The largest barrel manufacturer in Nova Scotia was International Cooperage Company of Canada Limited, with mills at Grand Pré, Ellershouse, Falmouth, Bear River, Princedale (Annapolis County), and South Brookfield (Queens County). These mills produced apple barrels, potato barrels and nail kegs. The company bought its first woodland in Nova Scotia in 1938 and today still has several thousand acres. (It now has its head office at Niagara Falls and produces steel drums, fibre drums, pallets and boxes, mostly in Ontario.)

Bernard Melanson of Belliveau Cove, Digby County produced hardwood staves in the 1930s and shipped them to the West Indies for molasses puncheons. Good quality hardwood stumpage was sold for $3 per thousand board feet at that time.

Barrel production eventually decreased in the early 1950s and wooden box production increased, utilizing an average of perhaps two million board feet a year from 1930 to 1950 about 12 million from 1951 to 1960. Boxwood production then began to slip gradually to slightly more than three million board feet yearly from 1974 to 1977.[69] Wooden boxes had been used for packing and shipping fish from the early 1900s. However, the use of boxes for packing apples started mainly in the early 1950s, as the use of barrels for this purpose decreased.

The maple sap industry was never large in Nova Scotia. Some 44,200 pounds of maple sugar and 8,400 gallons of maple syrup, valued at $44,500, were produced in 1944, mostly in Cumberland County with some in Annapolis and Lunenburg counties.[69]

Federal income tax had been started in the early 1920s but exemptions were so high and rates so low that most Nova Scotia lumbermen were virtually unaffected. This changed dramatically in the early 1940s, when, in order to finance Canada's share of the war effort, every profitable business was taxed.

Today, in most of Canada the forests are Crown lands, leased or licensed to the operators; in Nova Scotia, however, about 75 per cent is freehold. On Crown lands, the operators simply deducted their annual rentals for lease or their stumpage dues for cutting licenses from their profits for income tax returns. On freehold, the owners could deduct as stumpage costs only the original cost of the forest property proportional to the percentage of the volume removed plus the annual property tax. This was an unfair depletion arrangement. It was corrected somewhat in December 21, 1971 by legislation which set the value of each property by a qualified appraiser as of that date.[17] But freehold forest owners suffered from this unfair income tax practice for about 30 years.

MERSEY PAPER COMPANY LIMITED

From 1936 to 1940, Mersey Paper Company was logging and buying pulpwood on the upper branches of the LaHave River and driving it to Wentzell Lake, about nine miles above Bridgewater. At a loading plant the company had built there, this wood was jacked from the lake and loaded on box cars for delivery to the mill at Brooklyn.

In 1936 when river driving was the least costly way of getting pulpwood from the woods to the mill, part of Mersey's land east of Roseway River and on the headwaters of the Jordan River contained more than 50,000 cords of spruce, fir and hemlock. To get this wood to the Mersey River, R. L. Seaborne, Mersey's woodlands manager, designed a flume extending from Boot Lake, which drains to the Jordan, to Little Tobeatic Lake, which empties into the Mersey system. This flume was one and one-half miles long and had a grade of only 0.1 per cent. Starting with the spring drive in 1937, wood was lifted to the intake of the flume by a chain haul-up powered by a diesel motor which also provided power for a pump which lifted water 20 feet from Boot Lake into the flume. This system worked very well. The wood moved about three miles per hour in the flume.

That whole area was clearcut for the pulpwood species, leaving considerable pine and hardwood standing and this was all burned by a lightning fire in July 1942. After this a dense cover of young trees sprang up. White birch (averaging 4.7 feet tall) was the dominant species, with white pine (at an average height of four feet) ranking next in abundance. In the light shade of the birches the pine was healthy and free of weevils. Red maple, balsam fir, poplars and beech were found in small numbers. The frequency of the birch on the plots studied was 88.5, the pine 42.8 and the other tree species each 8.5 or less. Other burnt areas studied showed much poorer chances for successful coniferous regeneration.

The results of J. Lynton Martin's study in 1952-53 of eight areas burned over from one to 40 years previously showed that heavy cutting followed by light fires on the poorer soils of the southern upland of Nova Scotia encourages the invasion of heath plants. The presence of such plants in abundance on these sites produced serious limitations for tree regeneration.[89]

Mersey Paper Company built its first truck road in 1936, from the "Lake Road" to Tobeatic Lake, nearly 12 miles. The Lake Road was a public motor road built some years before, from Caledonia about 10 miles to what is now Lake Rossignol. From 1933 to 1937 Mersey was still buying spruce and fir pulpwood at $3 per cord at roadside and $3.75 per cord free on board box cars. Pulpwood prices for the next four years were as follows:

	1938-39	**1940-41**
Free on board cars	$4.00-4.50	$5.00-5.50
Free on board ships	$6.00	$7.00

Rates for cutting and piling four-foot pulpwood were $1.50 per cord and for cutting sawlogs, $3 per thousand board feet. The price of peeled pulpwood for export was $8 per cord free on board ships in 1937. The purchasing power of the 1940 Canadian dollar was 3.21 times that of 1980.

In that period, wood was shipped from Merigomish, Weymouth, Meteghan, Yarmouth, Cape Breton and ports along the south and eastern shores on Mersey's ships; the *Rover* and *Packet* carried 700 to 800 cords each trip. Mersey's pulpwood contractors for shipment by Mersey's steamships included Harry Wagner of Weymouth, J. Allen Parker of Musquodoboit Harbour, Byron Mitchell of Jeddore, G. G. Harnish (shipping from Prospect) and Dave Turner of Mosher's River. Emile Stehelin, Jr. of Weymouth was one of Mersey's pulpwood buyers and Alex (Sandy) Cruickshank was in charge of Cape Breton operations.

During the 1930s two colourful characters were captains of ships freighting pulpwood to the Mersey boom at Brooklyn. Captain Wrangdale was master of the *Tillie*, an iron-hulled ship powered by diesel motors. This ship, once a beautiful bark, still had parts of two masts when freighting pulpwood—but there was no beauty in her then. Captain Wrangdale had been skipper of nearly every type of sailing freighter from 1880 to the 1930s and had sailed the seven seas.

Capt. Wallace Ogilvie was widely known as being adventurous. He not only salvaged a number of wrecked ships and/or their cargoes, some under hazardous conditions, but acquired a German destroyer after the First World War and had it cut in half to make two small freighters. One of these he named the *Pyrenees*; this he operated himself, actually delivering a number of loads of pulpwood to Mersey in her. After a few years the *Pyrenees* ran aground on Mud Island off Woods Harbour, Shelburne County. The ship was lost, but there were no casualties and the insurance was supposedly collected.

Pulp was also carried in sailing vessels until quite late into the industrial era. On May 16, 1936 the schooner *Dorothy E. Snow* delivered 73 cords of pulpwood to Mersey from Meteghan. As late as 1937 baled pulp was shipped by the LaHave Pulp Company from Bridgewater to New London, Connecticut in a four-masted schooner.

Nova Scotia's share in the war effort was highly commendable. Army units took many men from industry. More than 70 men from the Mersey Paper Mill and hundreds from its forest operations were in the Canadian armed forces. The first three corvettes built in Canada went to sea under command of former Mersey officers J. H. S. MacDonald, C. W. Copelin and Richard Harris, all volunteers for the war's duration. All three survived and MacDonald and Copelin returned to Mersey's service.

Mersey Paper Company set up its first turndown sawmill at Shelburne River in 1940 to saw lumber for logging camps. At best, this mill produced only 8,000 to 10,000 board feet per day. It was moved to various locations on Mersey's lands during the next several years.

With the proclamation of the Small Tree Act (see Chapter 35), Mersey Paper Company and some other operators started partial cutting in forests suitable for this system of silviculture. Mersey started cutting in spruce, pine, hemlock and mixed forests where these conifers comprised at least 50 per cent of the gross merchantable volume and were generally from 60 to 150 years old, although some trees were much older. Trees to be cut were marked using paint guns. The object was to take 30 to 40 per cent of the volume. It was calculated that roads, skid trails and log brows would remove another 10 per cent.[90] Where overmature trees or balsam fir comprised more than 50 per cent of the volume, clearcutting was authorized.

Unfortunately, at Mersey the woodlands manager was in charge of both the woodlands department and the forestry department until 1958. The logging superintendent wanted only clearcutting and did all he could to oust any silviculture from Mersey's forest operations. Roadways were deliberately cut three times wider where they passed through coniferous forests than elsewhere, and other openings—such as log brow sites—were made unreasonably large. The woodlands manager did nothing to stop this, and as a result of the large openings in the forests there was more storm damage than there should have been. Logging contracts and stumpage sales were under the supervision of the forestry department and in these, selection cutting was quite successful because the openings were kept small.

About 1941 the St. Croix Pulp and Paper Company of Quebec bought the Nova Scotia Timberlands holdings and other woodlands, comprising a total of 67,000 acres, mostly in the Tusket River drainage system in Digby and Yarmouth counties. The truck road built by Nova Scotia Timberlands from

North Kemptville to New France in 1924-25 was extended by the St. Croi Company from New France seven miles to the public road leading t Weymouth. This company logged and shipped considerable pulpwood t Quebec by rail from Weymouth until the end of the war.

In 1946 the St. Croix Company's woodlands were purchased by Merse Paper Company through P. G. Boutilier of Yarmouth. A year later, Merse started producing lumber commercially for the first time with a portable mil moved from St. Margaret's Bay and set up in the Rossignol district. Wit added equipment, this type of mill did all of Mersey's sawing throughout th late 1940s and the 1950s. In 1949, Mersey's second portable mill bega operating in the Rossignol district. These mills were moved from site to site fo the next three years, sawing mostly good quality white pine and spruce logs.

In 1946, Mersey Paper Company began purchasing spruce and fir slab in four-foot lengths from sawmills in Nova Scotia. Fiddlehead barkers wer installed in the woodroom and in the next few years thousands of cords of thi material were utilized for pulp. However, the men doing the debarking wer paid by the cord, measured before processing. They soon learned that the could use more cords by taking much of the wood off each slab with the bark This wood wastage, which produced expensive pulpwood, was found to difficult to control and the project was soon abandoned.

In 1949, Mersey built a truck road to start logging operations on th upper part of the Medway watershed and started moving logs and pulpwoo entirely by truck instead of by river driving and sleds in winter. In building th road, Mersey was fortunate to find an esker (a long, narrow deposit of glacia material) in the right location and extending in the right direction. This was th start in Nova Scotia of trucking long distances from log brows directly to mills

Mersey observed its twentieth anniversary in November 1949. From mill payroll of 475 and a production of 65,000 tons of paper in 1929, its yearl output had increased to 120,000 tons.[72]

As the Mersey Paper mill increased production—its paper machines wer running 1,400 feet per minute in 1950—it required much more electric powe In 1948 the Nova Scotia Power Commission started to build a new larg concrete dam at Deep Brook on the Mersey River. The project was complete in July 1950. But in February of that year the dam suffered considerab damage when the earth portion weakened and a trickle soon became a torre sweeping through a 100-foot gap. This delayed construction for sever months.

That year, Mersey's production averaged 400 tons of newsprint per da The value of one cord of spruce processed in Nova Scotia and exported groundwood pulp was then $26.64, planks and boards were $27.25, ar newsprint $50.67.

CHAPTER 36

THE SMALL TREE ACT

The Small Tree Conservation Act and an Act Respecting Licensing of Scalers were passed by the Legislative Assembly in 1942, but neither was proclaimed until 1946. The Small Tree Act, as it was soon called, applied only to properties of 1,000 acres or more. Only about 40 per cent of the freehold land was in that class. The act prohibited cutting of spruce, pine or hemlock trees less than 10 inches in diameter inside bark at a point not less than a foot from the ground. This was the first legislation to control forest operations on privately owned lands in Canada.

A brief entitled "Forestry, Economy and Post War Reconstruction," signed by the 11 Nova Scotia members of the Canadian Society of Forest Engineers, was presented to the Minister of Lands and Forests in 1944. It made detailed recommendations for the management of the forests of the province.[69] The entire brief was printed in the Department of Lands and Forests annual report of 1944, and many of the recommendations were later implemented by the province.

An amended Small Tree Conservation Act was passed by the Nova Scotia House of Assembly in March 1946 and was proclaimed September 1. The amendment was important because it eliminated the discrimination against owners of 1,000 acres or more and applied the act to any operation of 100,000 board feet or more on all lands in any year except by permission or license by the Minister of Lands and Forests. In the early 1950s, the act was again amended so that it applied to any operation of 50,000 board feet or 100 cords or more in any year.

Penalties for violations were confiscation of trees cut and fines of not less than $500 and not more than $2,000 or, in default of payment, imprisonment for not less than six months and not more than one year.[69]

The licenses to cut spruce, pine or hemlock less than 10 inches diameter were issued upon recommendations of provincial foresters after they had examined stands for which applications had been made for cutting undersized trees.

Before this legislation the general practice in cutting pitprops and pulpwood had been to indiscriminately clearcut all material suitable for these products and anything else that could be profitably extracted at the time of cutting. In large operations, cutting started at the most accessible points and spread year after year until thousands of acres were cleared of merchantable trees, leaving those which were defective or of unwanted species. By 1946, most lumbermen had fallen into the clearcutting habit, taking almost any softwood that would make a 2-by-4.

During the Second World War, many fine stands of young spruce were stripped for pitprops as well as for pulpwood. Britain had then been short of mine props, which are produced from small, often immature, softwood. Annual production of such softwood in Nova Scotia ranged from 10,000 in 1930 to 28,000 cords in 1939; in response to the British need, it jumped in 1940 to nearly 68,000 cords and in 1941 to over 55,000 cords. It then fell back, largely because of shipping problems, to about the prewar production rate until the early 1950s.[69]

There were, however, extensive forests of mostly good quality spruce, pine and hemlock mixed with poor quality fir and hardwoods, particularly in central and western Nova Scotia. Better quality fir was the major species in Cape Breton and on the eastern part of the mainland. By 1946, the majority of the forests were even-aged, often less than 50 years old following fires and clearcutting. In general, the best woodlands were the remnants of uneven-aged forests where selective cutting had occurred once or several times.

"Selective cutting" is defined in the *Terminology of Forest Science* as "creaming, culling or high grading" and "selection cutting" is defined as "the . . . periodic removal of trees . . . from a forest . . . to realize the yield and establish a new crop of irregular constitution. The improvement of the forest is a primary consideration."

This selective cutting which extracted only the largest and best trees, even with the high grading, left growing stock in such condition that it survived post-logging storms on many areas and good quality residual trees reproduced their kind. These trees successfully competed with the trees of poor quality and undesirable species to produce good crops of large trees of desirable species in the same cutting system every 15 to 25 years. Where the volumes of the large trees cut exceeded 50 per cent of the total stand volumes, logging was usually followed by storm damage and much of the residual merchantable volume was lost. However, on these areas, spruce and pine regeneration was usually excellent.

Any partial cutting in forests of substantial spruce content which leaves good spruce growing stock that is not overmature and is of sufficient density to prevent storm damage is high order forestry. This includes thinning in young stands and shelterwood and selection cutting in mature and uneven-aged stands. Clearcutting, without planting or adequate provision for prompt regeneration of desirable species, may accidentally produce a fair cutting practice standard but it is too often poor or destructive.

Except in young forests, most natural regeneration is established before cutting. If it is not, it soon becomes established following partial cutting—but may require 20 years or more after clearcutting.

Clearcutting tends to increase the fir content of the succeeding forest. Fir, with its high susceptibility to damage from insects and disease and its lower wood density, is greatly inferior to spruce. The reason fir increases on clearcut lands is that fir seedlings have longer roots than spruce seedlings and can survive periods of drought that kill most of the spruce seedlings. Spruce regeneration does best in partial shade.

Red maple, an undesirable species except for fuelwood, also survives clearcutting very well, growing from suckers produced from the roots of trees blown down following the cutting. It and yellow birch are deeply rooted and literally provide nutrients for the shallow-rooted softwoods. On clearcut lands burnt after logging, coniferous reproduction is either a complete failure or at best understocked except on jack pine land. Fire not only destroys reproduction already established before and after cutting but also greatly reduces the viability of the land as a seedbed. Fire on partially cut land generally does much less damage to the soil.

In general, diameter-limit cutting, as prescribed in the Small Tree Act, is cheap partial cutting and poor silviculture. Too often it removes vigorous trees above the limit and leaves defective and weak trees below the limit. Unless diameter class distribution is reasonably uniform throughout the stand, too many trees are removed from some parts and too many left in others. Nevertheless, diameter limit cutting is often successful.

In 1952, Dr. J. M. Gibson, Dean of the Faculty of Forestry, University of New Brunswick, reported to the Government of New Brunswick regarding the operation of the Small Tree Act in Nova Scotia. Commenting on selection cutting of trees marked by forestry personnel, he said:

> . . . the residual trees show fair acceleration after the cutting, the stand is healthy and there has been very little windthrow as the result of cutting . . . in these selection cut stands the spruce reproduction is establishing very satisfactorily. Clearcut stands of the same type also show very good reproduction but here this reproduction is dominated to some extent by mountain maple and hardwood suckers. In the clearcut stands there is little prospect of pulpwood for many years and fire can wipe out the stand with slight possibility of any satisfactory coniferous reproduction following such a burn.

A number of lumbermen have told the writer that, had there been no Small Tree Act, they would have had no sawtimber to cut in the 1960s and 1970s. Although strongly criticized in some quarters, the amended Small Tree Act saved many young spruce forests from being clearcut.

CHAPTER 37

GRADING AND CUTTING

In 1946 the Maritime Lumber Bureau (MLB) grades were used on numerous graded spruce samples shipped to the United Kingdom. These were well received and arrangements were made for premium prices for MLB grades in that market. Graders were trained and producers were informed of the advantages of shipping graded lumber. For the first time, lumber from the Maritimes competed on an equal footing with lumber from the Baltic seaports.

The total forest production for the province in 1947 was over 537 million board feet and in 1948, more than 493 million. This production in 1947 consisted of 433 million feet of lumber and 158,000 cords of pulpwood plus pitprops, shingles, laths, staves and headings, boxwood, poles and piling. In 1948 lumber production was down to 376 million feet but pulpwood was up to 174,000 cords.[69]

Until 1953 hardwood lumber production generally averaged about 10 per cent of the total lumber production. This was the last of the salvage of birch killed by the dieback in the 1940s. From then on it rarely exceeded 5 per cent, and since 1966 hardwood has usually accounted for only 2 to 3 per cent of the total lumber production.

In the late 1940s the demand for timber for creosoting increased sharply. Red pine, rarely found in eastern Nova Scotia, was sought for poles and piling, and considerable volumes of hemlock were also sawn for timbers for this trade. At first most of this material was moved to the creosoting plant in Truro by rail; then trucking gradually replaced the rail haul. Nova Scotia species other than red pine and hemlock are unsuitable for creosoting.

The first patent on the chain saw as it is known today was granted in Germany in 1855, but it was not until the 1930s that gasoline-powered chain saws were used. These were two-man saws weighing from 80 to well over 100 pounds, mostly used in the big timber on Vancouver Island. Then in 1936 the H. A. Stihl Company of Germany began exporting a unique 46-pound chain saw with an excellent lightweight motor. A few were tried in eastern Canada and later in British Columbia, but they were not popular. Around the same time the U.S. Forest Service started an "equipment development laboratory" in Portland, Oregon and demonstrated chain saws in many places in the West. The Stihl saw was vigorously promoted and at last the power saw was accepted. Then Hitler started Germany's rampage and the Stihl supply ended. Companies which had been marketing Stihl saws in the West started making them and, in 1938-39, the Reed Prentice Corporation of Worcester, Massachusetts began making Wolf saws with gasoline motors.[91,92] In late 1941 several outfits were producing chain saws, mostly gas-driven and patterned after the Stihl rigs, which no longer enjoyed patent protection.

According to Charles I. Miller's *History of Chain Saws*, the real breakthrough in chain saw efficiency came with the development of a unique type of saw chain. Joe Cox, a logger and spare-time inventor, took a lesson from ". . . watching the destructive larvae of the timber beetle *Ergatus spiculatus* for many hours. The wood worms' cutting action was . . . side to side, rather than scratching or burrowing straight ahead."[90,91] Cox adapted the concept to a chain of his own design. Put into production in the late 1940s, Cox's Oregon brand chain saw was an immediate success and marked the foundation of Omark Industries, a Portland (Oregon)-based corporation that still dominates a worldwide market.

The development of the power saw was timely, because the abundant post-war woods labour force of hard-working men was fast shrinking. Most were not willing to work as hard or as many hours a day as people had before the war. Before the advent of the power saw, the average man-day production of four-foot pulpwood was from 1.2 to 1.7 cords. With the power saw it was about three cords per day.

EARLY PROGRESS

CROWN LANDS

In 1934 the Lands and Forests Act was revised, abolishing the position of chief forester and establishing the position of provincial forester. Unlike the original act of 1926 which had detailed the duties of the chief forester as the head of the department, the new act did not provide for a technical forester to head the department, nor did it prescribe the duties of the provincial forester. F. A. Harrison, with the title of chief clerk and a salary of $2,700 per year, headed the department under J. H. MacQuarrie, Minister. G. W. I. Creighton became provincial forester at $2,000 a year.[51]

In the same year a systematic survey of the province's Crown lands was started to determine what was really Crown land and to provide boundaries so that such land could be identified and mapped, and protected from trespass and plundering. A year later, in the Lands and Forests office at Halifax, a start was made at revising and completing a consolidated index of Crown grants. This was based on federal topographic surveys begun in 1923 in conjunction with aerial photographic surveys following extension of geodetic triangulation. These surveys, along with the 1914-18 military surveys, provided the framework for local surveys to be plotted on cadastral maps. The Crown land boundary surveys of the 1930s were made by staff compass.

At the same time, the Department of Lands and Forests started buying granted lands, mostly clearcut or burnt, at 25 cents an acre. In 1936 some 20,000 acres in Cumberland County were purchased at 30 cents an acre but when surveyed, it was found that, due to overrun in the grants, the actual cost was only 19 cents per acre. This land became the nucleus of the Chignecto Game Sanctuary.[51]

From 1927 to 1933 the total reported Crown land acreage in the province ranged from 1,416,466 to 1,436,000; in 1934 it increased to more than 2,315,000. Of this, more than 905,000 acres were included in leases in 1927; however, this leased acreage shrank to almost nil as the 20-year leases expired in the 1940s.[69] In 1935 the department stepped up Crown land boundary surveying and, as individual blocks were completed, undertook forest inventories. In the summer of 1934, axemen and chainmen were paid

$1.50 per day plus board, and the cook earned $50 per month. Survey costs averaged about $18 per mile compared to about $1,200 per mile in 1980. The forest inventory was made by using vertical aerial photographs taken by the R.C.A.F. Cruise lines were run at intervals of 10, 20, and 40 chains, depending on the size of the area involved and the forest regularity. This was the first use of aerial photos by any department of the province.

An encouraging feature brought to light by the cruising of Crown lands was that large areas classed as barren in Dr. Fernow's report of 1912 were fully stocked with forest reproduction and young growth by 1935. However, as explained previously, much of this was the result of erroneous classification in the Fernow report—classifying Crown land areas, well stocked in 1912, as barren.[70] From 1934 to 1938 inclusive, the boundaries of 436,210 acres of Crown land were surveyed, mostly in Halifax County. The total acreage of Crown land in Nova Scotia in 1938 was estimated to be 2,154,001 acres, of which 1,588,670 acres were reported to be leased.[69]

In 1936 the federal government was negotiating with the province for land for the Cape Breton Highlands National Park and land was expropriated for the purpose by the province. The area included that part of Inverness County from the south bank of the Cheticamp River north to Cape St. Lawrence, excluding most of the settlements at Pleasant Bay and Red River. In Victoria County it extended from South Ingonish to the north side of the Cabot Trail, excluding the villages of North Ingonish, Neil's Harbour, Dingwall and Cape North. In 1938 the land in Inverness County north of Pleasant Bay was abandoned by the park authorities and land south of the original expropriation was added. In 1940 this park covered 367 square miles. The area delineated for the park included considerable vacant Crown land in Victoria County, plus larger Crown land areas in Inverness and Victoria counties held under the 99-year lease by the Oxford Paper Company of Maine. There were also some 300 private holdings, including 70 homes. In some cases, this caused distress for people who had occupied their homes for all or most of their lives.

FOREST YIELDS

In the annual report of the Department of Lands and Forests, dated December 31, 1937, F. A. Harrison wrote that previous predictions of timber shortage were based on the high standards of a time when only readily accessible timber of large size was considered merchantable.[69] With the advent of the portable sawmill and the growing demand for pulpwood, these standards were greatly reduced by 1937 and previously inaccessible forests were stripped. Calculating increment or yield of undisturbed even-aged forests of similar types is comparatively simple when essential data are available. Forecasting future volumes or the so-called allowable annual cut of forests as extensive and as variable as those of all Nova Scotia is a more complicated task. However, this can be done with some reliability if there are no unforeseen disturbances and if the future productivity of the forest is similar to that of the past. But there were unforeseen changes, as there always will be. For instance there was the extensive abandonment of farmland, mostly in the 1920s and the 1930s, which returned many thousands of highly productive acres to forest lands. Many of these areas produced a cord or more of limby white (cat) spruce per acre annually for 40 to 50 years, a crop which had to be utilized at about that age or it deteriorated very quickly from attacks by the spruce bark beetle. In addition fire, storms, man, insects, tree diseases and even wildlife have all had their effects on forest yields, making them less predictable. Nevertheless, industry requires reasonable assurance of adequate raw material in order to establish mills which may cost millions of dollars.

Pairs of vertical photos when examined under a stereoscope provide a wealth of information on topography, forest density, tree heights and, to a limited extent, tree species. At first, only black and white photos were used. Where good, clear photos were available they gave excellent results. However, spruce and fir with their conical crowns look alike on an aerial photo and it is likewise difficult to distinguish between pine and hemlock. In fact these last two species, with their rounded crowns, are even confused with hardwoods. Nonetheless, surprisingly accurate timber estimates have been compiled from aerial photos with little or no sampling on the ground—but this requires an estimator with considerable experience.

In the early thirties, Mersey Paper Company's chief forester, with no information except self-supervised growth studies in Cape Breton and several areas on the mainland, estimated the net annual increment of only merchantable spruce and fir to be approximately a tenth of a cord per acre of all wildland in the province. At that time, Mersey's cord of four-foot wood was considered to contain an average of 88 solid cubic feet, which a standard cord of softwood does contain if the wood is well trimmed and well piled. (The publication *Forestry in the Atlantic Provinces*, published at Ottawa in 1968 by the Atlantic Development Board, erroneously gave this tenth of a cord per acre figure as being the growth rate estimate for all species.[93]) The total acreage of such land was estimated to be about 10 million acres, yielding about a million cords of spruce and fir annually. He erred in not considering the reversion of extensive farm acreage to forest with its high forest increment rate. Besides the extensive acreage of farms abandoned in the 1920s and 1930s, it was estimated that farm acreage decreased from 790,000 in 1941 to 370,000 in 1971, bringing still greater acres of fast-growing spruce into the equation. Then the trend reversed, bringing farm acreage to 395,000 by 1976.

In *The Forest Resources of Nova Scotia*, published in March 1958, Hawboldt and Bulmer reflected these changes by estimating the growth rate of all species at a sixth of a cord per acre per year.[94] Later estimates were slightly more optimistic. The Committee of the Canadian Pulp and Paper Industry estimated the Nova Scotia softwood growth rate to be a quarter cord per acre and the Atlantic Development Board estimated the hardwood increment rate to be one-fifth of a cord in 1965.

FOREST FIRES

A crucial factor in improving forest yields is forest fire prevention and control. In 1933, the province was divided into 21 ranger districts each with a chief forest ranger and a sub-ranger. The chief rangers also served as game wardens.

From 1931 to 1945 inclusive 4,895 forest fires burned a total of 251,183 acres, according to Department of Lands and Forests reports. This was an average of over 326 fires a year, with an average acreage of 51.4. In that period 16 were started by lightning (burning 2,025 acres), and 644 fires were reported to be incendiary—started deliberately by people. Many of the others were the result of carelessness. Nearly 10 per cent of the area burnt was timber, over 8 per cent cutover, more than 35 per cent young growth and about 47 per cent barren.[69]

Most forest fires in Nova Scotia occur between March and November, with May being the month of greatest frequency. This is the time of year when the forest floor and the leaves which fell the previous autumn are dry and the new foliage has not yet developed. For the period from 1931 to 1961, fires occurred in May in 17 of the 29 years reported by the Department of Lands and Forests.

Winter fires are confined mainly to the western counties and usually do little damage to forests. In 1932 and 1949 there was at least one fire each month from February to October inclusive. Two bush fires occurred in January 1944 in Nova Scotia—one in Digby County and the other at Argyle Sound, Yarmouth County. The latter seriously threatened the village of Argyle Sound and was finally brought under control after it had travelled more than a mile. During most of January 1944 it was so dry in western Nova Scotia that fires would run nearly anywhere except in swamps and bogs. Many of the farmers along the south shore were burning brush and pasture land, and the Argyle Sound fire was one that got away.

From the standpoint of damage and control, the spring fires are mostly flashy, running over the dry ground litter quickly but not burning into the soil, which is generally wet or at least damp. They are usually easy to control except under strong winds. The most destructive fires, and the most difficult to control, are generally those of the late summer and fall in dry years, when the water table is at its lowest and fire burns deeply into any organic material.

The worst fire year between 1923 and 1980 occurred in 1934, when the reports show 61,984 acres burnt in 690 fires from April to September inclusive. Approximately 20,801 acres were burnt in May and 20,244 acres in August. The total acreage was reported to have been 9 per cent merchantable timber, 7 per cent cutover, 33 per cent young growth and 51 per cent barren. About 40 per cent of the total area burnt was in Cumberland and Pictou counties and 22 per cent in Halifax County.[69] Perhaps the fire losses would have been smaller if the department's entire experienced ranger force had not been dismissed following the election in 1933. The reported causes of fire in 1934 were:[69]

Cause	Number of Fires	Acres Burnt
Unknown	318	25,476
Buildings	21	37
Campers	13	802
Brush burning	25	386
Berry pickers	34	763
Railways	65	4,571
Sawmills	21	15,165
Children	35	874
Smoking	53	1,516
Fishermen	23	4,360
Incendiary	82	8,035

The largest single fire in 1934 occurred in May and covered more than 10,400 acres.

The department's firefighting equipment then comprised about 25 portable motor pumps in working order, less than 1,000 feet of hose per pump, several hundred back tanks, and a few pails, shovels and axes for each crew. Volunteer firefighters were paid 18 3/4 cents per hour—equal to $1.50 for an eight-hour day. Meals were provided and usually consisted of bread, butter, tea, sugar, bully beef, bologna and jam. During the depression, some men welcomed a fire so they could earn this pittance and obtain food—some of which they carried home along with pails and shovels. In fact, it was said that some men started fires in order to get this employment—and that was one reason the wage scale was kept low.

Due to the serious fire hazard in May 1934, the Minister of Lands and Forests issued a proclamation closing the forests to travel without a permit on the mainland until July 20. Because conditions were still very dry at the end of July, the proclamation was extended to September 15.

After the disastrous fire year of 1934, forest fire protection began to improve. New equipment was obtained by the Department of Lands and Forests and detection and early warning of fires were better. From 1915 to 1934, fire losses were 471,274 acres in 3,940 fires—an average of 119.6 acres per fire. In the next 20-year period, from 1935 to 1954, some 5,493 fires burnt 232,736 acres—an average of only 42.7 acres per fire.[69]

In 1949 R. H. Burgess was appointed Provincial Forester under Deputy Minister of Lands and Forests G. W. I. Creighton. The department then had 12 technical foresters, a forest entomologist, a wildlife biologist, 4 land surveyors, 7 game sanctuary wardens and 21 provincial forest rangers besides a considerable office staff. Firefighting was a major concern of the department. It had been found that comparatively small numbers of trained firefighters were much more effective in fire control than large crews of volunteers. Trained men were therefore stationed at Stanley, Chignecto and Shubenacadie and moved to fires by air, often for long distances; usually they had fires well under control before the local rangers could round up crews of volunteers. There were 17 fire towers, besides 4 manned by private companies. Some 264 motor pumps, 4,029 back pumps, 635,000 feet of hose and a considerable supply of pails, mattocks, axes and shovels were kept on hand. Fire equipment also included jeeps, heavy duty trucks with removable 800- and 500-gallon tanks, a low-bed trailer, tractors and other vehicles. The supply depot and garage at Shubenacadie was completed in 1948.

The year 1947 was a bad one for fires, particularly in eastern Nova Scotia where nearly 30,000 acres were burnt over.[69] In the entire province that year, 444 fires burnt almost 45,000 acres.[69] One of these fires was at Pleasant Bay on the Cabot Trail and it marred the beauty of that part of the trail and that portion of the national park.

The 1950 forest fire season, with 360 fires burning 15,062 acres, burnt only a little more than a third of the acreage affected in 1944. However, in 1950, nearly 13,000 acres were burnt in one fire at Upper Musquodoboit in May with considerable loss of merchantable timber. The larger properties affected were those of Hollingsworth & Whitney Limited, Halifax Power & Pulp Company Limited and Crown land.

At a time when reforestation in the province was in its infancy, most of these burns were left unplanted. From 1927 to 1950, the Department of Lands and Forests distributed 4.5 million tree transplants to private land owners from one forest nursery and four transplant stations. About 130,000 trees were planted in 1949 by Boy Scouts, school children and private individuals.

FORESTRY ORGANIZATIONS

Various forestry organizations, several of which had been established in the early 1900s, began to raise public awareness of the forests and man's impact on them—especially the impact of fire.

In 1908, the Faculty of Forestry was established under Dr. B. E. Fernow at Toronto University and the Canadian Society of Forest engineers (CSFE) organized in Montreal with Dr. Fernow as president and 12 charter members. This society published the *Forestry Chronicle*. In 1950 the name of the organization was changed to the Canadian Institute of Forestry (CIF). There were then 1,127 members, mostly foresters who had degrees in forestry or related subjects. The main object of the society was—and still is—the advancement of the members in the theory and practice of forestry. The Maritime Section of the CSFE was organized in 1937 and included 48 members for the four Atlantic Provinces.

The Canadian Forestry Association—a non-profit federation of provincial associations—was established in 1900 to create public concern about extensive standing timber losses from fire and other causes, to encourage afforestation and to distribute information to the public. Its membership has always included people in all walks of life. Through the years its support has come from provincial governments, forest industries and woodsmen. Some individuals in the association have made considerable contributions—people like Robson Black of Toronto who was president for some years; George E. Graham of Kentville, a retired general manager of the Dominion Atlantic Railway and Nova Scotia's most ardent supporter from about 1928 to the 1950s; J. L. VanCamp of Montreal who was secretary-manager of the association in the early 1950s; and Dal Hall of Toronto who has held that position since that time.

The Nova Scotia Forestry Association began to be quite active in 1959 when R. L. Seaborne became secretary-manager of the provincial association and particularly so from 1968 to 1977 when Bill Speed held that position. G. W. I. Creighton was a long-time president of this association, which has done so much to educate young people of Nova Scotia about the importance of forests and how to protect them against fire. Within a year or so of Speed's retirement, the Nova Scotia Association became inactive. Some of its good deeds have been taken over by the Nova Scotia Department of Lands and Forests and some by the Nova Scotia Section of the Canadian Institute of Forestry.

One of the programs the Canadian Forestry Association and its autonomous provincial affiliates undertook was the encouragement of better woodlot management through sponsorship of tree farms. An owner could have his or her property certified as a tree farm by pledging to follow basic management requirements. The aim of the tree farm movement was to stimulate good woodlot management by example. Although somewhat successful in the United States, this program was mostly a failure in Canada. It was, however, successful in part of Quebec and in New Brunswick for several years.

CHAPTER 39

LUMBER CAMPS

In the early 1930s, men working at day labour in the woods were paid $1.00 a day plus board. Those cutting and piling four-foot spruce and fir pulpwood at the stump were paid $1.00 per cord, and each cord-cutter was charged 75 cents per day for board. The solid wood content of spruce with the bark on was 88 cubic feet. So that hemlock would float in the river drive, it was cut and sap-peeled between May and August. The peeling was done with a tool similar to a leaf of an automobile spring, called a spudding iron. The pay for cutting, peeling and piling hemlock in four-foot lengths was $1.50 per cord of 100 cubic feet of solid wood.

There was no unemployment insurance in those days. Unemployment was so high elsewhere in Nova Scotia that many men, although inexperienced at woods work, came to Rossignol Lake woods to cut pulpwood. They even included lawyers and other professionals. Many stayed only a few days, didn't earn even enough to pay their board, and then walked the tote road 20 miles or more back to Caledonia to go by train or on foot to some other place seeking work.

Mersey's logging camps, like most others of that day, were similar to those of the late nineteenth century—built of logs, with board roofs covered with tarpaper. Each bunkhouse was separate from the cook camp—where the cook and cookee slept. The foreman and scaler occupied a separate small office shack built of boards. In the bunkhouse men slept in pairs in a four-foot-wide "breech-loading" bunk (i.e., a bunk entered from its foot end). The bunks, set up along the sides of the bunkhouse, were made of rough boards with some loose straw thrown in and they were separated by rough board partitions about a foot high. They were doubledeck bunks; along the foot of the lower bunk was a board known as the deacon seat.

In the Mersey camps each man was issued a pair of blankets made from used paper mill felt that had been laundered. For pillows, most men used spare clothing. In the centre of the bunkhouse was a large cylindrical stove, set horizontally, with a large kettle of water on it. The fuel was split hardwood in four-foot lengths. Above this heater the men arranged poles, hay wire and cord or rope lines for drying wet clothing; this practice usually produced an aroma of sweat. The camp floors were made of rough boards. Most bunkhouses had a door at each end and, in the tarpaper-covered board gable above the log portion of the wall, one or two windows let in some light. Windows were generally four feet by four feet. The camps had dim light by day and dimmer light by kerosene lamps at night. Ventilation was poor.

The only other furniture in the bunkhouse was usually a wooden sink at one end of the building with three or four wash basins, and a shelf at one end of the sink holding a pail of cold drinking water with a mug hanging on a nail beside it. Near the sink placed beneath the window that gave the best light, there was also generally a filer's bench. Occasionally a flour barrel rocking chair would be seen in a bunk house, made on a stormy day by some energetic woodsman.

The cookhouses were always clean and tidy. There were usually two long tables with long benches on each side and the table tops were covered with oilcloth. The cook's working area was at one end of the camp; it contained a large cook stove, a rack to hold the stacked 16-inch split hardwood, and tables and counters with zinc-covered tops. The dinner plates and mugs were enamelware and the cutlery was of cheap, rust-proof metal. A large sink, large cooking utensils, dishpans, several pails of water on a shelf beside the sink and slop buckets completed the furnishings. Sleeping quarters for the cook and the cookee were at the end of the camp, partitioned off from the eating and cooking area.

There was no milk, butter, eggs or margarine in the logging camps at that time and it was surprising how well the better cooks did at making bread, cookies, and cake without these staples. The meat was almost entirely salt pork and salt plate beef. The latter was usually more than half fat and gristle. Fresh beef rarely got to the camps but occasionally an injured ox was slaughtered and served. Salt herring was served weekly; the cooks marinated it and called the product Solomon Gundy. When available, the Solomon Gundy was on the table for most meals except breakfast. Salt cod was served occasionally. Vegetables were limited to potatoes, turnips, carrots, onions and cabbage and, as of yore, baked beans were served at nearly every meal. The fruits were prunes, raisins and dried apples.

In 1933 the lice and bedbugs got so bad at Mersey's Camp 5 at the head of Tobeatic Lake that the men decided to fumigate. The scaler got some sulphur and, before leaving for work that morning, the men hung their clothing on lines and poles in the bunkhouse to be fumigated too. They stuffed rags and paper into cracks and openings to hold the fumes in the camp. The scaler piled the sulphur on a tin pie plate, got it burning and went outside, closing the door tightly behind him. Only the foreman, scaler and cooking staff were then at the camp. Soon smoke was seen escaping from the building. They had forgotten, or did not know, that burning sulphur melts. It ran onto the dry floor and started the fire which destroyed the camp with all its contents. For several days the men doubled with the crew at the nearest camp, with only the clothes they had worn to work that day.[95]

CHAPTER 40

TRAPPING AND THE FUR TRADE

After approximately a century of protection, an open season on beaver in the seven western counties—November 16-30, 1943— provided the first legal trapping of this furbearer. Each trapper was licensed and permitted to take three beaver in the county of his residence. The pelts were marketed by the province and the average price per pelt was paid to each trapper, regardless of size or quality. At the winter sale of 1944, some 2,789 pelts were sold at the Canadian Fur Auction and the trappers received $39.22 per pelt. The province retained a royalty of $2.00 per pelt. Another open season in 1945 resulted in the harvest of 6,144 beaver pelts in the same counties under the same regulations as in 1943.[69]

As fur styles change, the economic importance of the various species of furbearing animals also changes. From the early twenties until 1950 long fur was popular. This trend led to higher values for fox, raccoon, wild cat and lynx pelts. Trapping and fur farming tended to concentrate on these long-fur animals until the 1950s.

When rabbits are scarce in a region, the predatory animals apparently migrate to a considerable extent. Nova Scotia fur buyers' reports show that, in some years, the mink catch has been high in the western counties and in other years high in the eastern counties. These migrations appear to be associated with the abundance of rabbits in the different regions. A number of the predators remain in the regions of scarcity of rabbits, however, preying on partridge and other birds and small rodents. That is one reason why there is usually a scarcity of partridges in a region within a few years of reduced rabbit populations.

By 1943 lynx were said to be extinct in Nova Scotia except on Cape Breton Island. The year before, 130 pelts had been reported. Trappers, however, were still taking some on the mainland from time to time well into the 1950s. Thus seven lynx pelts were exported from Antigonish County in 1954, the last year in which the Department of Lands and Forests reported fur pelt exports by county. No lynx pelts were exported in 1974 and 1975 from Nova Scotia; however, 39 were exported in 1976.[69] From 1931-1941, a yearly average of 577 wildcat pelts was exported, but during the next five years this average was 999. From 1947 to 1964 inclusive the number fell to only 372. From 1965 to 1976 inclusive, 21,365 wildcat pelts were exported, averaging 1,780. The maximum export reported for one year was 2,423 in 1976 and the minimum 142 in 1956.[69]

On November 30, 1937 there were 1,012 fox ranches, 239 mink ranches and 18 muskrat ranches in Nova Scotia. By 1950 there were only 85 fox ranches, and a year later—because of depressed markets for long fur—only 50. Fox pelt exports reached a high of 31,420 in 1939 but were as low as 269 in 1958. These were mostly silver fox from ranches but in 1953, 1,275 of the 1,634 fox pelts were from wild animals, mainly red foxes. In the fifties most of the fur ranchers changed from foxes to mink. By 1972 exports of mink pelts had reached the maximum of 113,834, from a low of 1,964 exported 20 years before. From 1959 to 1968—the only years that exports of ranch and wild mink pelts were reported separately—only slightly more than 2 per cent of the exports were those of wild mink.

The muskrat has been the most consistently trapped animal; pelt exports have ranged from a maximum of 57,815 in 1953 to a minimum of 11,906 in 1959, nearly all from wild animals. Artificial impoundment of water has reduced muskrat habitat over the years but the number of these animals still continues high; 50,406 pelts were reported exported in 1976. For some years prior to 1930, the open season for trapping fur animals was November 16 to December 31. The muskrat season was changed to March 1 to April 30 during 1931 and 1932, on the theory that the November-December season led to the taking of too many immature muskrats and pelts that were not prime. In 1932 the season was changed back to the year-end period and has continued so ever since.[69]

Between 1931 and 1976 the minimum yearly export of raccoon pelts was 527 (in 1958) and the maximum was 7,355 (in 1976). Most were from wild animals.

Otter pelt exports ranged from 53 in 1933 to 721 in 1975. Weasel or ermine pelt exports fell drastically from 16,466 in 1932 to 215 in 1971.

The red squirrel harvest, inactive in 1927, produced 1,460 pelts in 1930 and then fell back to an annual average of about 300 for the next five years. From 1936 to 1954 a total of 860,896 squirrel pelts was exported; the highest recorded export was 147,970 in 1949. From 1957 to 1976 the squirrel skin export was somewhat lower, ranging from 760 in 1959 to a high of 11,941 in 1966.[69]

These variations in the numbers of furs exported were due to many factors, including style changes, the rise and fall of rabbit or hare populations (for the predatory furbearers), and the incidence of disease in such furbearers as skunk and raccoon. Surprisingly, the Second World War did not reduce the number of pelts taken. In fact, the number of mink, muskrat, wildcat and squirrel pelts actually rose in those years.

Live-trapping of beaver in box traps in the Tobeatic Sanctuary was begun in 1934 to establish new beaver colonies in places where there had been none for years. That year, five beavers were moved to Cumberland County, where beavers had been extinct for 140 years. From 1934 to 1944, a total of 285 beavers was live-trapped in western Nova Scotia and liberated elsewhere, as follows.[69]

County	**Number Liberated**
Cumberland	15
Halifax	104
Guysborough	55
Victoria	4
Colchester	21
Pictou	48
Antigonish	29
Cape Breton	2
Richmond	7

Nine beavers were also liberated in Cape Breton Highlands National Park.[69]

With greatly improved law enforcement, this relocation of beavers proved highly successful. On the mainland they multiplied rapidly; their establishment in Cape Breton was slower.

FOREST PESTS

EUROPEAN WINTER MOTH

The European winter moth, *Operophtera brumata*, is a defoliator introduced into Nova Scotia about 1930, apparently on apple tree nursery stock imported from Holland to Milton, Queens County. As with the fall cankerworm, its hosts are mainly apple and other trees and shrubs of the rose family, as well as oak and elm. But a number of other deciduous trees are attacked by this insect. Persistently repeated severe defoliation produces dead twigs and branches and ultimately the death of the tree.

This insect winters in the egg stage, with the larvae hatching usually in May. Feeding on the foliage until late June or July, they drop to the ground on silk-like threads, construct pupation cells and remain until they appear as moths from late October to mid-December. Male moths have a wingspread of about 30 mm but the females are practically wingless. Unable to fly, they crawl up tree trunks where they deposit their eggs in bark crevices or other sheltered places.

The first mention of the European winter moth in a Department of Lands and Forests report occurred in 1950. The fall cankerworm, however, had been described as causing severe defoliation in most of Queens County as early as 1938. These two insects are so similar in habit and appearance that it is probable that many of those identified earlier as cankerworms were really winter moths. The infestation spread and by 1953 had reached most of mainland Nova Scotia and part of New Brunswick.

By 1954 a small number of parasites had been imported from Europe and released to control this defoliator. Federal entomologists released more along the south shore of Nova Scotia in 1959, but by 1960 the winter moth was found throughout the province. In 1963 the liberated parasites were well established. These, along with a viral disease which developed in the winter moth, then began reducing the winter moth population in western Nova Scotia. By 1966 this destructive defoliator was practically extinct in this province. This is one of the best examples of control of an imported pest by introduction of parasites from its native habitat. Before the invasion was wiped out, however, it had done considerable damage to hardwood trees, particularly oak. In fact winter moths, along with other pests, killed practically all the mature oaks in the forests of western Nova Scotia. Young and immature oak usually survived.

The winter moth was also a nuisance in towns and cities where it attacked shade trees, mostly elms. A number of communities acquired hydraulic spraying equipment and sprayed their shade trees for several years, using DDT under prescriptions from the federal Department of Agriculture. Where there was no spraying, many shade trees were almost completely defoliated repeatedly and the winter moth larvae, hanging on their threads as they grounded to pupate, were most obnoxious. Although the spraying with DDT did kill some songbirds, starlings consumed many of the poisoned larvae and appeared to thrive on them. Toads and frogs died, however, and toads have not returned to most sprayed areas.

HEMLOCK BORER

The flat-headed hemlock borer, *Melanophila fulvoguttata*, infests mainly hemlock but it also sometimes kills white pine, spruce, larch and balsam fir. A native insect throughout eastern North America, it usually attacks trees weakened by some other cause such as flowage or defoliation by other insects. It kills many old-growth hemlock affected by insolation (sunburn) on the lower part of the trunk. This accounts for the dying hemlock found in partially cut forests and along roads where the lower tree trunks are exposed to the southwest. Sometimes when an infestation becomes established in weakened trees, healthy trees are also attacked. This occurred in 1930-31 following the raising of Lake Rossignol's water level. There was also some mortality of hemlock from insolation following road and trail construction in the development of Kejimkujik National Park around 1966, and there are many other instances of this condition producing tree mortality.

WOOLLY APHID

The balsam fir "gout," thought in 1929 to have been caused by a virus, was identified in 1931 by Dr. R. E. Balch, entomologist of the federal Department of Agriculture, as being caused by the insect balsam woolly aphid (*Adelges piceae*). In 1933 a biological control program was started and four predaceous species of insects were imported from Europe—but to no avail. In 1950, as the infestation continued to spread and increase in intensity, the control program was expanded. In all, 22 species of predators have been introduced from various parts of the world and four have become established. These, with native insect predators, provide limited control; however, the aphid infestation is still extensive and ruining fir trees.[83] It has also caused damage to Fraser fir and silver fir in western Canada and the western United States, where it was probably introduced from Europe on nursery stock.

Fortunately the balsam woolly aphid infestations in New Brunswick, and to a lesser extent Nova Scotia, have decreased considerably since 1960. Although predation and other factors may have influenced this decline, the major factor appears to have been temperatures below -30 degrees Fahrenheit, which kill balsam woolly aphids. Between 1930 and 1960, when populations were high and damage was severe, there were only six winters when the temperature dropped to -28 degrees Fahrenheit or lower. Between 1960 and 1966, when populations were low, there were four winters in which the temperature dropped to that extent. As explained in Part 10, there has been a recent trend towards decreasing winter temperatures in eastern North America. However, the trend is slow and the Maritime Climatic Zones (5B, 6A, and 6B as shown on the plant hardiness zone map) will likely provide suitable climate for the woolly aphid for many years. In these zones there has never been a recorded temperature as low as –30 degrees Fahrenheit. In any winter prior to 1981, the probability of a temperature of -15 degrees Fahrenheit was 3 per cent for zones 6B and 7A, on the south coast of Nova Scotia.[96]

SAWFLIES

A serious threat to Nova Scotian forests was posed in 1936 by the European spruce sawfly, a defoliating insect. It was first found in America on the Gaspé Peninsula about 1928, and by 1936 it had wiped out nearly all the spruce there and was causing serious damage in New Brunswick.[69] At that time it was also established in Cumberland, Pictou and Guysborough counties and, even though the populations were low, was causing great concern. More than 430,000 parasites of six European species were liberated in those three counties, as well as many more in New Brunswick, by the Forest Biology Division of the federal Department of Agriculture.

In 1939, as the result of a viral disease which spread through the spruce sawfly population, the numbers of that pest were comparatively few in Nova Scotia. The European parasites may also have offered some control. But by 1945 it was still the most important defoliator of spruce in the province, at its worst in local areas in Cumberland, Halifax and Kings counties. In 1947, samples of this insect were gathered throughout the province, but only in small numbers and the threat was considered to be over.

Populations of the larch sawfly increased considerably in 1936. Attempts were made to establish a species of parasite in Nova Scotia which had proved successful in Manitoba and Quebec. This was unsuccessful here and there are still frequent localized larch sawfly infestations.

9 THE TWENTIETH CENTURY: 1951-1982

World demand for paper brought unprecedented expansion in the province's pulp and paper manufacturing capacity, changing the traditional emphasis from sawlogs to pulpwood. This in turn led to a revolution in logging technique, a greater need for accurate inventory data, a search for ways to increase forest productivity through silviculture, and renewed concern for fair and effective taxation and legislation. At the same time a movement to organize woodlot owners has been gaining strength. While firefighting technology is vastly improved, acceptable solutions to the spruce budworm epidemic are hard to come by, storm damage is a constant threat and acid rain a new worry. As the province moves into the final decades of the twentieth century it must mobilize its considerable capacities in forest production, silviculture, inventory and human resources to optimize the benefits for all. It must be especially careful to maintain its softwood sawlog stocks, which are in danger of depletion on all but parklands and on lands owned by those practising selection cutting.

INDUSTRIAL EXPANSION

The period from 1951 to the late 1960s was one of rapid industrial expansion in the pulp and paper sector and of new capacity in fibreboard. Two large pulp mills were built, one on the Strait of Canso and one near New Glasgow, and a new hardboard plant was established. Bowaters Mersey invested large sums in mill modernization and built a large new sawmill. There was a new emphasis on access road building, which set the stage for improved productivity and increased silviculture.

NOVA SCOTIA FOREST INDUSTRIES

In 1955, when the ailing steel and coal industries were facing serious employment problems, the Province tried to attract new industry to Cape Breton. Extensive Crown lands with low cost pulpwood available ultimately induced Stora Kopparberg of Sweden to build a bleached sulphite pulp mill at Point Tupper, Inverness County. It was incorporated as Nova Scotia Pulp Limited and development started in 1956. Under the Nova Scotia Pulp Limited Agreement the new company was given cutting rights to approximately 1.3 million gross acres of Crown land containing about 1.0 million acres of productive forest. The stumpage rate was $1.00 per cord, equivalent to about $2.77 in 1980 dollars. This acreage eventually included the comparatively small amount of Crown land licensed to Bowaters Mersey Paper Company after the province discontinued Bowaters Mersey's agreement in 1959.

In 1955 the Canso Causeway was completed, providing a railway and highway crossing of the Strait of Canso between Cape Breton Island and the mainland. A drawbridge near the Cape Breton side allows passage of ships through the strait. The causeway made Cape Breton much more accessible to the mainland and produced one of the best deep-water year-round harbours on the Atlantic coast. Before the causeway was built, tides raced through the strait and drift ice from the Gulf of St. Lawrence rushed back and forth with the tides in winter. Without the causeway, Nova Scotia Pulp Limited (now Nova Scotia Forest Industries) would hardly have been viable.

Construction of the pulp mill started in 1959 and production began in 1961, using about 300,000 cords of softwood annually. The pulpwood consumption in 1963 was 75,000 cords from Crown land and 183,000 cords of purchased wood.

According to the *Financial Post* of September 18, 1965, the operation was:

> . . . a $40 million 125,000-ton-a-year bleached high-grade pulp mill. The mill uses a patented sodium-bisulphite, two-stage pulping process developed by Stora Kopparberg in Sweden. The process is said to be new to North American mills.
>
> Almost the entire output of the mill is marketed in the U.S. and Canada. . . . At capacity the mill consumes about 260,000 cords annually. Nova Scotia Pulp is owned 80% by Stora Kopparberg Corp., New York and 20% by Scott Paper Co.

Hans Linberg of Sweden was the first woodlands manager of this company. He was followed by A. H. Anderson of Prince Edward Island and then by Hans Akesson of Sweden.

In 1960 the Province, at considerable cost, terminated the lease of the Crown lands still held by the Oxford Paper Company south of the Cape Breton Highlands National Park, and added them to those of Nova Scotia Pulp Limited. The Mariana Timber Company truck road was a second ready means of access to this large block of Crown land for Nova Scotia Pulp Limited.

In 1962 Nova Scotia Pulp Limited started an extensive road program, including extension of the Mersey Paper Company road from Hunter Mountain northward and connecting the Mariana Timber Company road to a public road leading east from Frizzleton on the Northeast Margaree River.

From 1963 to 1965 inclusive, Nova Scotia Pulp Limited salvaged 49,500 cords of pulpwood killed by the defoliating hemlock looper and harvested over 40,000 cords of green wood on the highlands. The wood was cut in eight-foot lengths and moved by rubber-tired skidders, sometimes up to a half mile, to truck roads where it was loaded on tractor-trailer units and trucked 90 to 100 miles to the mill at Point Tupper.

In 1963 Nova Scotia Pulp Limited produced 75,000 cords of pulpwood cut on Crown land and 183,000 cords of purchased wood. A strike in the pulp mill that year limited pulp production to less than 120,000 tons.

It was decided in 1969 to expand the sulphite mill to 175,000 tons per year and to install a newsprint facility to produce 160,000 tons annually. To provide the increased volume of wood, a new agreement between the province and the company under its new name of Nova Scotia Forest Industries Limited (NSFI) was required. This agreement covered the 1,300,000 acres of Crown land already leased to the company plus another 200,000 acres.

Through a roundabout wording of the new agreement, the stumpage rate was to be increased from $1.00 per cord to $2.75 per cord with the understanding that the additional $1.75 per cord produced was to be used for silvicultural treatments. The stumpage rate in fact remained at $1.00 and the company did some silvicultural work in thinning immature balsam fir stands where Mersey had cut pulpwood on the Cape Breton highlands. Some planting of trees of other species was also done.

From 1961 to 1976, NSFI deliveries of pulpwood to its mills at Point Tupper amounted to 5,094,129 cords. Of this, 2,162,347 cords came from Crown lands, 2,829,324 cords from private lands and the equivalent of 102,458 cords was comprised of sawmill chips. Maximum production was reached in 1974 when 280,472 cords were delivered from Crown land, 312,652 from private lands and 11,822 cords in sawmill chips, making a total of 604,946 cords.

MERSEY/BOWATERS MERSEY

From 1950 to 1959 Mersey Paper Company cut about 5,000 cords annually on licensed Cape Breton Crown land. Nearly all was taken from the Crowdis Mountain portion of the Cape Breton highlands Crown land, comprising 22,500 acres south of the Oxford lease line, after 1950. Mersey had built a good truck road from the Cabot Trail near Hunter Mountain 10 miles or more to well beyond Crowdis Mountain on this plateau. This was Nova Scotia Pulp Limited's first means of motor access to the highlands and the road was extended northward by the new company.

All of Mersey's operations in Cape Breton, where the softwood stands are largely fir, were clearcuttings. Barring fire, fir regeneration is certain in these areas—even where other species are planted.

In 1954 Mersey shipped approximately 74,000 cords from Richmond, Victoria, Inverness, Antigonish and Guysborough counties. About 40,000 cords were delivered to the paper mill at Brooklyn by steamer and 34,000 cords by rail. The 5,000 cords from Crown land and some of the purchased wood were loaded on ships by a floating loading plant in Nyanza Bay.

Until 1954, Mersey's lumber had been sold to Eddy Lumber Company, Maritime Lumber Distributors and other Canadian buyers. Then the company started shipping directly to the United Kingdom. Mersey's ship the *Liverpool Packet* was used until about 1958, after which tramp steamers were chartered as required.

Mersey's million-cord agreement with the Province was supposed to be effective from 1929 to 1959, with provision for renewal to 1989. When the Province cancelled the agreement in 1959, Mersey was offered a new 40-year agreement for a lease of 272,000 acres of Crown land in western Nova Scotia, with rather stringent silvicultural requirements. If the forests on these lands had been as good as indicated by the provincial forest inventory of 1958, the agreement would have been executed. But the Province and the company jointly had these lands cruised by an independent party and much of the forest was found to be of inferior quality. For such forests the silviculture requirement was not justifiable. Negotiations were discontinued and since 1959 Mersey has held no Crown land.

The province and the company did make an extensive trade of lands in 1966, which proved mutually advantageous in consolidating holdings and greatly reducing boundary maintenance. This was the first forestry agreement with the Province that benefitted Bowater Mersey.

In 1955 Mersey's paper machines were running at 1,700 feet per minute; the company would soon spend $4,000,000 for extensive improvements and expansion. Mersey had a net profit of $3,263,000 that year and the consolidated earned surplus was then over $10,000,000. The fixed assets were worth $21,818,000.[72]

Then, several deaths changed the face of the company. In 1955, the Chairman of the Board of the Mersey Paper Company since its conception, J. McG. Stewart, died. Six months later major stockholder, I. W. Killam, died at the age of 70, while salmon fishing on the Cascapedia River, ending a career that had begun in the early 1900s when he was a newsboy in Yarmouth. When he died he held more than three-quarters of Mersey's common stock.

On April 19, 1956 the Halifax *Chronicle-Herald* announced that the controlling interest in Mersey Paper Company, valued at $35,000,000, was up for sale to the highest bidder. British, American and Canadian interests bid furiously for the 155,000 shares of Mersey, representing 78 per cent ownership, owned by Mrs. Killam who was I. W.'s sole heir. Toronto financiers put a nominal value of $200,000,000 on the Killam estate. The Bowater Corporation of North America was the successful bidder, paying $53,754,501 for all the property, assets and undertakings of Mersey as of April 30, 1956. Besides mills in England, Australia, Norway, Sweden and Ireland, Bowater owned the large newsprint mills at Corner Brook, Newfoundland and Calhoun, Tennessee.[72]

Mersey Paper Company had started using chips from sawmills for chemical pulp in 1954 and by 1961 used the equivalent of approximately 45,000 cords each year. Ten per cent of this material was from Mersey's own sawmills and the rest from other mills in Nova Scotia. Mersey installed unloading facilities and conveyors for this rapidly increasing supply of wood which changed the operation of a number of the larger sawmills from economically marginal to profitable.

Bowaters Mersey started making sulphite pulp with a sodium instead of a calcium base and in 1964 closed its limestone quarry operations at East River, Lunenburg County. (The sodium process makes stronger pulp.) The limestone quarry had operated since 1929. In 1966 Anil Canada Limited purchased the quarry, located only a few hundred yards from its hardboard plant, to use it as a reservoir and to cleanse the mill effluent before draining it into Mahone Bay.

In 1976, at a cost of five million dollars, Bowater Mersey [the "s" was dropped by a name change in 1968, Ed.] installed machinery for making thermo-mechanical pulp (TMP). This process, in which chips are heated in steam at high pressure, produces a high yield of top quality pulp per cord of wood but consumes considerably more electricity than the sulphite or groundwood pulp processes. In 1976 installation provided 16 to 18 per cent TMP in the paper "recipe." The increased paper strength permitted machine speed acceleration to previously unheard-of levels—exceeding 2,100 f.p.m.—and a retention of Mersey's record as having the fastest open draw newsprint machines in the world. By 1979, TMP comprised 20 per cent of Bowater Mersey's pulp with 60 per cent groundwood and 20 per cent sulphite.[72]

In October 1965, the Mersey Mill started operating on a full-time basis, seven days a week, creating 50 more jobs as well as increasing production to 175,000 tons of newsprint paper per year. In increased wages and wood supply, this meant an addition of two million dollars to the provincial economy.[72]

In 1964, 10 years after the first log debarker and sawmill wood chipper were operating in this province, some 17 saw mills were shipping chips to Bowaters Mersey Paper Company and six mills were shipping to NSFI. These chips were equivalent to a total of about 90,000 cords of roundwood. Mersey's consumption of sawmill chips in 1965 was almost 78,000 cords-equivalent.

Bowaters Mersey stopped operating portable mills when it built a modern sawmill at Caledonia, Queens County. Sawing about five million board feet per year, this mill started operations in 1962 and continued until 1969 when it was dismantled. Its machinery was moved to an ultramodern mill at Oakhill, near Bridgewater. All of the company's lumber was then shipped from Bridgewater; the Oakhill site has been the company's lumber yard since 1966.

The new mill commenced operations in June 1969. It was equipped with a hot pond, a Cambio debarker, a live log deck, automatic carriage, a band headsaw and a band horizontal resaw. There was also an Oxford edger and a Forano push-button set edger, a trimmer and considerable conveying equipment, and a lumber sorting shed that contained 56 bays.

This sawmill has been very successful under the supervision of Arnold Meisner and now all of the company's lumber is sawn at this mill. With the band saws lumber recovery from logs is 7 to 8 per cent higher than it had been with circular saws.

Until the lumber market declined in late 1970 the mill was operated on a two-shift basis. Operation was reduced to a single shift except for a year or so in 1974-75, when the mill ran double-shift. With single shifts, annual production was about 10 million board feet. Until 1977 only rough lumber was produced but then a modern planer was installed and involvement in the local lumber market was increased. In 1978 the mill produced 40,000 board feet of spruce and pine lumber per day, and employed 58 people.

With the start of the recession and high interest rates in 1980, the demand for lumber fell drastically and at the time of writing this mill, like most others, operates only part-time.

In 1982 Bowater Mersey employed over 1,000 people directly and 2,700 indirectly in woods and mill operations. Each year more than $25 million is paid in wages and salaries and $12 million is spent in the province on goods and services. Newsprint paper valued at more than $100 million is distributed locally and abroad. In 1981, over $2 million was paid by the company in taxes to municipal governments. It is estimated that the Liverpool-based company puts more than $40 million in the hands of Nova Scotians each year.

From 1972 to 1982 Bowater Mersey reinvested over $50 million, and in 1982 spent $1 million, on silviculture. On April 30, 1982, the company manufactured its seven-millionth ton of newsprint on two of the world's fastest open-draw paper machines.

Various men have left their impression on this company, men like Albert Martin for several months in 1963 and A. E. Balloch of Bowaters' English organization who succeeded him. After about three years, Balloch was succeeded by M. G. Green, a Newfoundlander who left the presidency of the Newfoundland Power Corporation to come to Bowaters Mersey. Green was transferred to Corner Brook where he was president of the Bowater Newfoundland Company until he died of a heart attack in 1974. Wallace Clark had replaced Green as president of the Mersey Company only months before, when Green went to Corner Brook.

ANIL CANADA LIMITED

Anil Canada Limited was the outcome of a chance meeting between G. R.

Jolly of Bombay, India and Robert Manuge, General Manager of Industrial Estates Limited (IEL) of Nova Scotia, on a plane over the Pacific Ocean in 1965. The company built its mill at East River, Lunenburg County at a cost of $8,500,000. Construction started May 1, 1966 and production of hardboard commenced April 7, 1967. The site was selected for the high quality East River water, extensive areas of low-grade hardwood within 50 miles and its location adjacent to Highway No. 3 and the CNR line, running 37 miles to Halifax.

The original products were plain and decorative hardboard in 1/8- to 1/2-inch thicknesses. From 100 to 125 people were employed at the mill and the initial annual consumption of wood was 50,000 cords—all purchased wood. In the first year, the utilization was 65 per cent hardwood and 35 per cent softwood. Eighty-six per cent of this wood was from Lunenburg County, 7 per cent from Queens and 3.5 per cent from each of Annapolis and Kings counties.

This new industry was valuable to Nova Scotia in that it provided a market for wood of weed species and low quality, for which there had been no previous market except as fuelwood. Wood of any species was accepted provided there was not more than 20 per cent rot in any bolt or log. At first Anil did not buy good quality spruce or fir, and its average price of $16 per cord for wood free on board trucks in the mill yard was not competitive elsewhere except with fuelwood. That first year, wood of 21 different species was utilized, bark and all.

In the manufacture of Anil's hardboard, the wood was chipped and the chips were defibrated by high-temperature steam in what is known as the Asplund Defibrator Process, developed in Sweden. Resin, paraffin and alum were added to the pulp which was hot-pressed in sheets 7 feet by 16 feet and these were passed through heat treatment chambers. Upon finishing, the board was passed through a humidifying machine to add moisture equal to between 6 and 8 per cent of the weight of the board. Finally the sheets were sawn into market dimensions, sorted for grade and conveyed to the warehouse. The manufacturing continued in this fashion until 1971, when capacity was doubled by installing a second line of equipment. Until then the product had been mainly doorskins, sold mostly in the United States. Following a serious decline in the doorskin market Anil produced mainly 4- by 8-foot sheets of hardboard. In the early 1970s Anil produced exterior siding of good quality and a number of products for the automotive market, including sun visors. Good quality spruce and fir were required for the siding. From April 1967 to November 1975 Anil used about 45,000 cords of wood annually, approximately 75 per cent of which was hardwood. Then the company fell into receivership and IEL continued the plant's operation until July 1976 when Masonite Canada Limited bought the facilities.

Masonite produces what it calls colorlock siding; this is one of its best sellers besides decorative board, print board, 4- by 8-foot hardboard and ceiling tiles. The wood utilized now is 60 per cent hardwood and 40 per cent softwood. The latter must by 100 per cent sound for the colorlock siding. The other products are all hardwood. In Masonite's first year of production, 1976-77, approximately 54,000 cords of hardwood and 36,000 cords of softwood were used; the next year 100,000 cords were used. Using only sound softwood in its siding product, Masonite is competing with Bowater Mersey. Its softwood cost has gone up considerably. Availability of hardwood also became difficult as many people turned to using wood to heat their homes when the price of fuel oil began to climb in 1980. Masonite now hopes to buy most of its hardwood from Scott Paper and Bowater Mersey although there should be considerable hardwood available from Crown land.

SCOTT MARITIMES PULP LIMITED

In 1965 an agreement was made between the Province of Nova Scotia and Scott Maritimes Pulp Limited similar to that made with Nova Scotia Pulp Limited in 1956. This gave Scott a cutting license of approximately 230,000 acres in Halifax County. The company, a subsidiary of Scott Paper Company of Philadelphia, started a $50,000,000 kraft sulphate pulp project on 400 acres of land purchased at Abercrombie Point in Pictou County in 1955. The mill, designed to produce 500 tons a day, started operating in September 1967.

Before this, Scott had started lumber production in 1959, primarily for the British market, by contracting several small portable mills. In 1961, McCully and Soy Limited of Truro built a sawmill at Upper Musquodoboit to produce eight million board feet per year. Sawing under contract exclusively for Scott, they reached the 100 million board feet production mark in 1976.

To assure a sufficient wood supply for the large pulp mill, Scott purchased an additional 56,000 acres of woodland in the Wentworth Valley area in Colchester County from Seigneurie Timber Lands Limited of Saynbec, Quebec in 1966. The next year Scott purchased 298,000 acres from Minas Basin Pulp and Power Company Limited. These lands, mostly in Cumberland, Hants and Kings counties, comprised parcels scattered over 10 counties and extended as far west as Yarmouth County. This purchase included the new Minas Basin 10-million board feet per year sawmill at Parrsboro. By the end of 1976 Scott owned a million acres of freehold land and had cutting rights on 230,000 acres of Crown land in Nova Scotia.

The pulp mill capacity was increased to 600 tons per day, requiring 420,000 cords per year. About 175,000 cords of this was purchased from woodlot owners, contractors and lumbermen. In Scott's own operations, about 38 million board feet of sawlogs is now produced for its own sawmills, with some sold to other sawmills. All logging on the company's own lands is done by contract.

In 1973, Scott began a successful program with the Canadian Penitentiary Service at Springhill. Inmates were trained to do woods work and spent much of their parole time earning incomes working on Scott lands. The company also has a continuous woodlot management program with private owners, begun in 1974, under long-term agreements in return for wood supplied from their lands.

FUEL TAXES AND BETTER ROADS

As woods truck roads improved and trucking of forest products on private roads increased, forest operators paid more and more in motor fuel taxes for the use of their own access roads. It was illegal to use untaxed fuel in any licensed vehicle and it was impracticable to transfer loads of forest products from unlicensed vehicles on private roads to ones licensed for transportation on public roads. This problem was discussed in 1966 by representatives of the Nova Scotia Forest Products Association with E. D. Haliburton, Minister of Lands and Forests. He suggested a gas tax-access road arrangement rather than trying to keep records of vehicle mileage on private and public roads; this apparently satisfied all concerned.

In February 1967, the association proposed to the provincial government that an access road program be initiated on a cost-sharing basis. In April the Hon. E. D. Haliburton announced that the Province had made a grant of $300,000 available to the industry as a whole for that year—the estimated amount of taxes on motor fuels used on woods roads. The assistance was to be administered by the Nova Scotia Forest Products Association and the Department of Lands and Forests through its minister.

Originally $7,000, the maximum assistance available to any applicant in any year has gradually increased to $10,000. The minimum assistance is $1,000; in no case is the assistance more than 50 per cent of the determined cost of the road construction. For purposes of assistance the Province was divided into six districts and $46,000 per year was made available for each district. Any of the $46,000 not needed by a district was apportioned to the remaining districts.

The Nova Scotia Forest Products Association became the representative of all Nova Scotia forest industries in 1967 when it employed D. L. Eldridge as its full-time executive director and established an office in Truro. From a small group of lumbermen in 1934 the membership grew until it now numbers more than 500. Briefly stated, the objects of the association are to improve the production, marketing and profits of the forest industries as well as to better forest management. It is now the leading forestry organization of Nova Scotia.

The association today has an excellent access road committee to consider each application on its merits, including such factors as road site and specifications, land title and the desirability of the proposed cutting of the forest products. Completed roads are inspected by Department of Lands and Forests personnel before payment is made. No assistance was granted for roads qualifying for ARDA-Department of Lands and Forests assistance, nor for those aided by DREE from 1977 to 1982. From 1967 to 1981 inclusive, 2,843 miles of woods roads were built under this gas tax-access road program, involving 2,069 applications. The total amount distributed to forest operators was $8,255,160, and the average amount per application ranged from $5,787 in 1972 to $2,588 in 1981.

Motor roads now make it possible to reach areas considered inaccessible for logging in the days of river driving. Improved accessibility is definitely a factor in the reduction of the number of acres burnt by forest fires. Salvage of trees damaged by storms and insects is greatly improved with established road systems, and silviculture is less costly. As access roads reached into the forests in the 1960s, logging camps were gradually phased out. By 1970, most woods workers were spending their nights at home with their families.

MECHANIZED LOGGING

Improved access to forest stands and intensified harvesting also changed the pattern of logging. While machines especially designed for rough terrain and the felling and processing of trees removed much of the back-breaking labour, they also influenced cutting practices.

Until the advent of highly sophisticated logging and hauling equipment, the short-wood system predominated in pulpwood operations. Wood was mostly processed manually to uniform lengths between 4 and 16 feet and piled close to where it had been felled to await loading and transportation to driveable water or to roadside and then on to the mill. Numerous types of machines were developed, combining two or more functions of felling, delimbing, topping, bucking and piling. Despite the new equipment, Mersey still used 200 horses as late as 1960; its last horse was retired in 1967.

Low man-day productivity, lack of willing workers, high rates of pay and other factors associated with manual processing in the stump area led to a steady decline in the short-wood system on major operations in eastern Canada. It did not rebound until the Koehring short-wood harvester was introduced in large numbers.

In the 1950s the knuckleboom was developed. Mounted on various types of tracked and wheeled machines used in logging, it was controlled by long-distance transmission of medium-pressure hydraulic power to operate the boom and whatever attachment it had at its outer end: grapple, saw or felling shear. "From a concept originating in Sweden, the hydraulically powered knuckleboom grapple loader, as we know it, was developed in the Lake States and found its way into Canada via the Lakehead."[97]

Other equipment gradually changed forestry operations as well.

> The tree-length system reduced the volume of work performed in the stump area and, with the introduction of the articulated skidder and continued use of the power saw, rapidly became a widely accepted logging system in eastern Canada. . . . In 1976-77 there were between 11,000 and 12,000 skidders on Canadian operations.[97]

In eastern Canada, 95 per cent of the pulpwood produced in 1950 was short wood. By 1965, 42 per cent was short wood, 52 per cent tree length and 6 per cent full tree. Ten years later, these percentages had changed to 18, 74 and 8 per cent respectively.

Mechanization also revolutionized logging for sawtimber; modern machinery and motorized equipment have made logging and sawing an almost year-round operation. Mersey took its first step into mechanical transportation of sawlogs and pulpwood from the stump in 1950. Truck roads were built at approximately quarter-mile intervals and diesel-powered cable skidding was practised, using an A-frame. Trees were felled and cut into 8-, 12- and 16-foot lengths with power saws. Such practices occurred mainly in the old growth hemlock stands where clearcutting of all merchantable softwoods and even some of the best quality hardwoods was carried out. Pine and some spruce forest were also logged in this manner.

The hemlock forests were logged in the summer. Hemlock—and, unfortunately, the hardwoods—were sap-peeled so they would float in the river drive. The fast drying of peeled logs produced checking of the wood. Checks in hemlock, used as pulpwood, are not defects; but checks in the hardwood sawlogs are a very serious defect. In these operations logs were loaded on trucks by the skidding equipment and trucked to bridges over rivers where they were dumped for driving.

This procedure continued until around 1966 in most of Mersey's operations; horse skidding and hauling was still done in some areas until 1960. About 1966, the system was changed to power saw felling and delimbing and tree-length skidding to truck roads by rubber-tired skidders. There trees were cut into 8-, 12- and 16-foot log lengths by power saws. Eight-foot pulpwood was loaded on trucks by hydraulic loaders for delivery to the paper mill; sawlogs were loaded for delivery to the sawmill at Oak Hill, Lunenburg County.

In 1976 full-tree harvesting was started. It consisted of felling trees with power saws and moving them to truck roads with rubber-tired skidders. There the trees were delimbed and cut into 8-, 12- and 16-foot lengths by Haughn Harvesters, dumping the 8-foot pulpwood to one side and the sawlogs to the other. Each product was loaded on separate trucks for delivery to the respective mills.

From 1953 to 1963—except for a slight increase when timber blown down by Hurricane Edna was being salvaged—annual lumber production remained surprisingly constant. The number of sawmills, however, decreased from about 900 to around 550. As road-building equipment and techniques improved, portable mills gave way to stationary mills and the average mill began to produce more and better lumber each year.

Following implementation of the federal Fisheries Act to reduce pollution to rivers and coastal waters, river driving decreased and ultimately ceased in the early 1970s. However, companies soon learned that once pulpwood or logs were loaded on trucks, it was no more expensive to truck them directly to mills than to truck them to rivers. Modern trucks, carrying up to 20 cords or 9,000 board feet per load, largely replaced rail hauling of roundwood; this material is now sometimes trucked well over 100 miles.

A major disadvantage in river driving was sinkage losses which, with spruce and fir, averaged 3 per cent the first year the wood was in the water. Another disadvantage was river and lake pollution. The bottoms of some of the larger rivers became literally covered by pulpwood, logs and bark except where there were rapids. An advantage in river driving was that wood containing 60 per cent or more moisture remained sound. Sometimes, too, when wood became scarce, the sunken wood and timber would be salvaged.

From 1950 to 1970, employment in logging dropped 25 per cent or more while output of industrial roundwood increased by about 30 per cent. Today's loggers are on average better skilled, better educated and older than the loggers of yore. A large number are self-employed on contracts and many are highly paid. They live well without working year-round. The improvement in efficiency through mechanization is today offset somewhat by costly repairs and by time lost due to equipment breakdown. As harvesting equipment became more complicated it became more expensive and more liable to lost time for repairs. Lost time with such equipment, costing from $150,000 to $250,000 for each unit, involves high interest costs without income to cover them. Such heavy equipment can also destroy regeneration and advance growth, leaving the land inadequately stocked. The Province and most of the larger companies now have extensive tree nurseries, and planting at a cost of $250 or more an acre now follows much of the logging. However, when heavy equipment is used, the treads that pass over the ground tend to compact the soil. This often prevents or retards growth for many years.

In 1970 two Koehring Harvesters were put on the Cape Breton Highlands to process fir pulpwood. This machine, the largest used in eastern Canada, measured 15 by 32 feet, weighed 40 tons empty, carried a 15-ton payload (7 cords) and rolled on 8 1/2-foot diameter wheels. Today's Koehrings are essentially the same. The lone operator can shear trees off their stumps and feed an automatic processing unit. The unit delimbs, shears to 8-foot lengths and loads the wood on the machine. The completed load is then transported to roadside and piled by the grapple part of the harvester. Working 24 hours a day, the harvester can produce 60 cords per day to roadside—more than 12 times the man-day production of conventional manual operations. However, a 55-ton load on wheels is indeed a heavy soil compactor, too.

PROVINCIAL FOREST INVENTORY

Expansion of the industry meant taking a closer look at what was actually going on in the forest. More wood was being cut than ever before, and forest managers needed to know just how much capacity the provincial resource had, and what it could sustain.

THE ALLOWABLE ANNUAL CUT

The provincial forest inventory recommended by the Voluntary Planning Board in 1963 was started by the Department of Lands and Forests in 1964, under the supervision of R. M. Bulmer. The province was divided into seven approximately equal subdivisions and one of these subdivisions was to be inventoried each year.

The subdivision of Pictou, Antigonish and Guysborough counties was photographed from the air in 1964. Photo-interpretation, cruising, compilation and reports followed. By 1971 photography was completed for all counties, and the second cycle began in Pictou, Antigonish and Guysborough counties.

There have been two reconnaissances and two inventories of mainland Nova Scotia's forests. They were carried out by: Titus Smith Jr., 1801-02; B. E. Fernow, 1909-10; Belanger and Bourget, 1958; and the Nova Scotia Department of Lands and Forests, 1965-71. Except for the reconnaissance of Titus Smith in 1801-02, all these surveys gave estimated acreages of forest types and other classes of land. The acreages that follow were calculated from the Smith report by the writer from the estimated mileage of each type crossed by Smith in his traverses of the mainland. Percentages of the total area of the mainland were then applied to the acreage given from the survey of 1965-71.

The forest and land types reported from these surveys are summarized as follows:

MAINLAND NOVA SCOTIA
FOREST AND LAND TYPES BY ACRES

Type	Titus Smith 1801-02[26]	B. E. Fernow 1909-10[70]	Belanger & Bourget 1958[94]	Dept. of Lands and Forests 1965-71[98]
Softwood	2,650,000	1,036,175	3,981,591	4,420,840
Mixedwood	2,140,000	3,685,007	3,200,080	2,598,720
Hardwood	2,890,000	330,856	454,161	1,570,430
Swamp	447,000	—	—	—
Deleted	—	—	234,397	9,310
Total forest	8,127,000	5,052,038	7,870,229	8,599,300
Bog & marsh	135,000	37,793	475,427	412,210
Brush	260,000	—	—	356,630
Barren	1,061,000	1,986,354	931,943	147,490
Recent burn	812,000	551,098	—	—
Agriculture	—	1,854,416	1,204,150	678,550
Urban	—	—	—	78,430
Rights-of-way	—	—	—	116,110
Unclassified	—	137,424	234,297	5,490
Total Non-forest	2,268,000	4,567,085	2,845,817	1,794,910
Grand total land	10,395,000	9,619,213	10,716,046	10,394,210

Smith's "Barren" included land which had been burned before 1790, and some of it bore forest regeneration by 1801-02. "Recent burn" presumably included areas burned not more than 10 years before the reconnaissance. Smith's reconnaissance was entirely inland and included none of the agricultural land; urban lands would not have comprised a large area then anyway. Much of what he classed as hardwood was later cleared for farms. Because of this, and the transition of some hardwood areas to mixedwood and softwood following the beech bark disease of the 1920s and the birch die-back during the 1940s, there was undoubtedly considerably more hardwood land in Nova Scotia in 1802 than there is today. Smith's "Swamp" was included in the other forest types in the later surveys. Again, because his traverses were all inland, the estimate compiled from Smith's reconnaissance excludes salt marshes.

Allowable annual cut (AAC) is defined as the volume of wood or timber that can be harvested annually on a perpetual basis. The gross merchantable volume of softwood shown in the report on the 1965-71 inventory—excluding that on federal lands—was 6,283,040,000 cubic feet or 73,918,000 cords. Hardwoods comprised 2,721,747,000 cubic feet or 33,349,000 cords. Volumes on the federal lands are excluded as they are not available for utilization or management.

If there were an equal distribution of age classes and if all lands other than federal lands were available for management, the resource could have supported an allowable annual cut of about 1,848,000 cords of softwood and 834,000 cords of hardwood in 1971. However, a great deal of woodland is now held by owners who are producing no forest products and this trend may increase. Furthermore, no allowance is made in this estimate for the overmaturity of most of the 14 million or more cords of balsam fir in Cape Breton, most of which has since been lost. According to the Department of Lands and Forests' Annual Report, actual forest production in the calendar year 1971 excluding fuelwood was approximately 1,246,600 cords of softwood and 12,600 cords of hardwood.[69] This volume ran uncomfortably close to the allowable cut. Calculating the AAC of a forest can be done reasonably well for short periods of several years or less, but any major interruption in the regularity of growth or consumption calls for a correction. Such an interruption can consist of a positive factor such as improved forest management or a negative one such as fire, insect infestation or overcutting. This calculation can be made in several ways; each requires an inventory of the forest.

As of 1974, the Department of Lands and Forests estimated the Nova Scotia AAC to be 1,152,940 cords of softwood and 487,180 cords of hardwood. In 1977 a task force appointed by the provincial government calculated the AAC to range from 1,238,000 cords to 2,052,000 cords of softwood and from 466,000 to 768,000 cords of hardwood. Variations in this calculation result from a waste-cull range of 10 to 30 per cent and private participation in production ranging from 50 to 90 per cent. The task force stated that the indications were that softwood species were being overcut by 10 to 20 per cent while less than a third of the allowable cut in hardwoods was being harvested.[99]

Using the more conservative estimate of AAC of the task force, the forest production and the percentage of allowable cut for the years 1960, 1970 and 1980 would have been as follows:[99]

Year	SOFTWOOD Cords Produced	 Per Cent of Allowable Cut	HARDWOOD Cords Produced	 Per Cent of Allowable Cut
1960	604,000	48.8	19,000	4.1
1970	1,090,000	88.0	85,000	18.2
1980	1,504,000	121.5	247,000	53.0

The task force table that follows shows the estimates of actual cut and the estimated allowable cut as of 1977 by subdivisions of the province.

Estimated Annual Cut and Range of Annual Allowable Cut for Subdivisions of Nova Scotia (M Cords/Year)[99]

SUBDIVISION	SOFTWOOD Actual Cut	 Allowable Cut Range*	HARDWOOD Actual Cut	 Allowable Cut Range
Eastern	359	209-354**	30	83-143
North Central	245	219-352	40	85-134
South Central	244	221-367	26	66-109
Valley	139	115-180	25	55-91
South Shore	127	107-182	50	43-73
South West	106	146-228	3	55-84
Cape Breton	290	224-392	5	81-136
Province	1,509	1,238-2,052	181	466-768

SUBDIVISION	TOTAL WOOD Actual Cut	 Allowable Cut Range
Eastern	389	290-497
North Central	285	303-485
South Central	270	287-475
Valley	164	169-271
South Shore	177	150-255
South West	109	201-311
Cape Breton	295	304-528
Province	1,690	1,703-2,819

* Based on waste/cull range of 10-30% and on private participation level of 50-90%

**209 = 30% cull/waste + 50% private participation; 354 = 10% cull/waste + 90% participation.

CONTINUOUS INVENTORY

Work on the provincial continuous forest inventory started in 1964. This program provided for the establishment of 250 tenth-acre plots each year to a total of 1,750 plots randomly located throughout the province. Plots are remeasured at five-year intervals.

A large and rapidly growing group of people now acquire forest property in Nova Scotia for many reasons other than to produce wood. These reasons include weekend and holiday camping, fishing and hunting, cottages and speculation. In more recent years a growing number of Europeans, particularly West Germans, have bought Nova Scotia properties, some with extensive forest acreages. Few of these people are producing forest products.

The unique ownership of land in Nova Scotia and the forest production comparison of 1967 and 1976 are illustrated in a table compiled by R. M. Bulmer in 1977.[100]

	Forested Land			**Production**			
				1967		**1976**	
Ownership	**Number**	**Acres**	**%**	**Cu.Ft.**	**%**	**Cu.Ft.**	**%**
Small private (10-1,000 acres)	30,000	5,600,000	54	55,000,000	58	51,000,000	45
Large private (1,000 & over acres)	170	2,300,000	22	28,000,000	30	42,000,000	36
Provincial Crown		2,500,000	24	11,000,000	12	22,000,000	19
Total		10,400,000	100	94,000,000	100	114,000,000	100

(The data in the above table are rounded to the nearest 1,000,000 and per cent.)

Nova Scotia pulp and paper and hardboard industries own or have under stumpage agreements approximately 3.25 million acres (31 per cent of the total area). The lumber industry, other than that controlled by pulp and paper companies, owns or has under stumpage agreements approximately 500,000 acres (5 per cent) of the forest land of Nova Scotia. The pulp and paper companies have foresters and forest technicians capable of managing forest resources.

In 1965 and 1966, ARDA provided for a land capability classification for forestry, mapping all the lands in seven classifications to show all mineral and organic soils according to their capabilities.

BETTER SILVICULTURE

Inventory data indicated the need for improved productivity to maintain the forest industry and to provide for future expansion. This led to a greater awareness of the need not only for planting, but for stand tending at all stages.

METHODS

In 1964, Lands and Forests Minister E. D. Haliburton and four other Nova Scotians visited Scotland and Sweden to see the silviculture practised there. They were greatly impressed with the successful forests of Scots pine, Sitka spruce and Norway spruce which had been planted on the heath lands of Scotland.

There are over 500,000 acres of nonproductive heath lands in western Nova Scotia and apparently no effort has been made to reforest these areas although studies on treeless lands in Yarmouth and Shelburne counties were conducted by the Canadian Forestry Service and the Department of Lands and Forests in 1968. Some tree planting trials were made and soil and site preparation started but nothing has been heard of this project since.

The Small Tree Conservation Act had been proclaimed in 1946 but it was not until 1948 that the province had sufficient trained personnel to enforce it. From then until 1953, over 450,000 acres were examined, involving 1,985 separate operations.[69] By the end of 1952, 1,305 small tree licenses had been issued, permitting clearcutting in 540 operations on 102,933 acres, partial restrictions in 470 operations on 95,742 acres, and cutting to diameter limits of from five inches to nine inches in 295 operations on 49,288 acres. Licenses to cut trees less than 10 inches in diameter were refused for 227 operations on 30,550 acres and 453 operations on 174,654 acres where no small trees, as defined in the act, were being cut.[69]

One bad feature of the act was the exemption of small operations, where small trees were being cut indiscriminately. From 1953 to 1957 inclusive, only 4.2 per cent of the total private land was examined under the act and only 27 per cent of the province's total forest production was harvested under its restrictions.[69]

The Small Tree Act, which remained in force until 1965, was quietly ignored by nearly everyone concerned except those, including Mersey, still practising shelterwood and selection cutting in some adaptable forests. Many woodlot owners still wisely maintained their growing stock by selection management. Beginning in 1966, after the Small Tree Act was rescinded, it became the policy of Scott Paper Company to confine its forest harvesting to clearcutting; Mersey also reverted to clearcutting entirely.

Most of Scott's harvesting was apparently in mature and overmature stands where there was abundant natural regeneration. Clearcutting merely released the advance spruce and fir seedlings which reputedly averaged 15,000 per acre after five years. Losses such as regeneration destroyed by mechanical logging, the growth choked out from being covered by slash and the spruce reproduction which dies in dry summers must be debited against such abundance. To provide the partial shade so essential for prompt red spruce regeneration, Scott instituted in 1972 a policy of cutting strips 330 feet wide, and followed it until 1975. Advance regeneration flourished adjacent to the strip margins but it was unsuccessful over the remainder of the clearcut strips. Mersey had had the same experience with strip cutting in 1965.

In 1976, Scott expanded its silviculture program and provided for the planting of 500 acres and the spacing of immature stands on another 400 acres. The next year the area was increased to 1,000 acres of planting and 1,500 of spacing. In recent years approximately 75 men have spaced about 3,500 acres of immature forests annually.

Beginning in a small way in 1977, Scott started other silviculture practices as well—shelterwood and release cutting and thinning of merchantable stands. These practices now encompass about 2,000 acres annually. Shelterwood harvesting, costing about $48 per acre, is the most common treatment in younger stands comprising primarily spruce and fir.[101] In older stands, both tree-length and full-tree harvesting methods are successful in removing 20 to 40 per cent of the volume, and windthrow has therefore not been extensive. In the release cutting, red spruce saplings beneath a canopy of poor quality hardwood are conserved by careful felling of the hardwood. For $75 to $100 per acre, the equivalent of a good plantation 10 or more years of age is thus created. At the time of writing, Scott Paper Company's planting cost is said to average $250 per acre.[101]

In 1960, now owning approximately 750,000 acres of land in southwestern Nova Scotia, Bowater Mersey started a continuous forest control system.[102] A total of about 1,400 permanent sample plots of one tenth of an acre each was established and all the trees on each plot were measured, numbered and evaluated. The same plots are remeasured every five to seven years; the third remeasurement was started in 1979. Information from these plots is compiled and provides the basis for the management of the company's forests.

This company has four woodlands districts, each directed by a district superintendent. Logging is done by company crews and by contractors. Each year the paper mill utilizes about 230,000 cords of spruce, fir, hemlock and birch roundwood, as well as chips from purchased roundwood and supplied from company lands and two other sawmills.

The first intensive silviculture carried out on large holdings was the thinning of balsam fir thickets on the Cape Breton Highlands by NSFI in 1969. NSFI and some other companies started planting trees, mostly red pine, in areas where Mersey Paper Company and its successor, Bowaters Mersey, had clearcut pulpwood prior to 1959. The real surge in silviculture came with the realization that forest depletion was exceeding increment by a considerable margin. This brought about the introduction of the Canada/Nova Scotia Subsidiary Agreement for Forestry in 1977. Before this, in 1972, 1973 and 1974, ARDA provided $942,600 or 60 per cent of the $1,571,000 paid for improving private forest land in Nova Scotia. Some $1,108,000 of this amount was for 441.5 miles of road construction; the balance was paid out for boundary lines, fire ponds, Christmas tree growing and silviculture.

REFORESTATION

Reforestation in Canada dates only from the beginning of the century; by 1972 man-made forests represented only 0.3 per cent of Canada's forest lands. Artificial forestation is increasing appreciably and by the mid-1980s it should exceed 500,000 acres per year. Even then man-made forests in Canada will represent only 2 per cent of the productive forest land.

In 1970 about 250,000 trees were planted in Nova Scotia, more than 75 per cent of them on Crown land. This number was expected to increase to approximately 28 million by 1984.[69] Such a rapid increase in artificial regeneration has meant the development of new and expanded forest nurseries, both provincial and private. The provincial nursery at Strathlorne, Inverness County, with an annual capacity of 10 million seedlings, is expected to provide transplants for the Cape Breton areas stripped by the budworm.

Research in forest fertilization in Canada started in the 1960s and it is still mainly in the research and development stage. It has potential in tree nurseries and plantations and in mature stands about 10 years before harvesting. In 1973 there were 20,000 acres of mature forests under fertilization trials in Canada. Of this acreage, 5,000 were in the Atlantic Provinces.[103]

ACID RAIN

Acid rain is being blamed for the deteriorating salmon and trout fishing in Nova Scotia. No doubt acid rain contributes to this deterioration, but increased siltation and higher summer water temperatures produced by extensive clearcutting must be accepted as part of the cause. For instance, until 1940 the Mersey River and its tributaries provided excellent trout fishing. But by then much of the Mersey forest had been clearcut and the trout population decreased. The numbers of salmon in the river also fell soon after the power dams were built in 1928; no fishway was installed at the No. 2 dam.

On the upper Medway waters good trout fishing lasted well into the 1960s because the clearcutting there started about 20 years later than on the Mersey River lands.

The term "acid rain" has been popular but it is more properly termed "atmospheric deposition" because solids and gases from the atmosphere are deposited on land and water surfaces when there is no rain almost as much as when there is. Major sources are believed to be emissions into the atmosphere from factories and all fuel burning, mostly from urban sources, including motor vehicles. A specific example of concentrated atmospheric deposition occurred in the fumes from the smelter at Trail, British Columbia, destroying farm crops in the State of Washington in 1929. More recent examples closer to home have been white pine killed by sulphuric fumes from pulp mills in New England and the Maritimes. The trees killed were mostly within a half mile of the fume source but there must be some effect on forest growth farther away.

Long-range transport of emissions by weather systems has made atmospheric deposition a potential threat to forest, farm, and aquatic ecosystems. The increased rates of acidification of soils and waterways are of major concern.

Some of the world's most sophisticated apparatus to monitor pollutants was set up at Kejimkujik National Park in 1980. This Long Range Transport of Air Pollutants (LRTAP) monitoring station is one of only five in Canada. It records air, water, and vegetation qualities in an effort to establish baseline data to serve as a comparison for future acidic environmental changes. Kejimkujik Park was chosen as the major Atlantic site because of its relatively pure environment. The soils and lakes in this region have naturally low pH values (high acid levels). So they were acidic before there was any atmospheric deposition of pollutants from industry. But they have also maintained good forest growth—where they have not been burned—and strong natural fish stocks.

There is reluctance to start voluntary or legislative controls of the so-called acid rain problem until the sources, extent, and potential effects are better understood. The sources are controllable to varying degrees by pollution abatement technology and by changing sources and supplies of energy; however, the costs of such measures are tremendous.

ASSESSMENTS, TAXES AND FOREST LEGISLATION

As the importance of forest lands to the wellbeing of the provincial economy became more apparent, taxation came under scrutiny and the need for better regulation was realized.

During a 30-year period until 1976, the municipal property tax was particularly vicious on forest lands in Nova Scotia. Few municipal assessors knew forest values, and assessments were often arbitrarily set high. Assessments of larger properties and of lands held by absentee owners were usually higher per unit of value. Assessment appeals were numerous and usually successful.

In the 1950s, land and timber had a wide range of assessed values in the different municipalities, determined according to the whims of the assessors. The extremes are as follows:

	Assessment per Acre	
Land Class	**Minimum**	**Maximum**
Cultivated	$1.00	$75.00
Pasture	1.00	15.00
Timber I	1.00	60.00
Timber II	1.00	30.00
Woodlots	1.00	7.50
Cutover	—	6.75
Waste	—	1.00

Some assessors classed only easily accessible fuelwood as woodlots. Others included any of the other classifications (except Waste) as woodlots.

The Nova Scotia Assessment Act was at fault because it provided for taxation of land and what grew on the land but exempted farm crops, Trees, however, the growing forest crops, were taxed annually as they grew. Woodlands were assessed, according to the intent of the act, not on their capitalized income value or productive capacity but on their liquidation value—the value which could be secured only by removing all the merchantable trees and selling the land or by selling the land and the standing trees together. Thus forest taxation did more to encourage liquidation of privately owned woodlands in Nova Scotia than did any other factor.

During the 16-month period ending March 31, 1951, 44 properties containing a total of 122,219 acres were reconveyed to the Crown. Including this acreage, the total land acquired to March 1951 from private owners or at tax sales, amounted to 389,585 acres.[69]

In 1958, following numerous complaints about the Nova Scotia Assessment Act and its administration regarding forest properties, the Hon. R. C. Levy, Minister of Lands and Forests, appointed a committee to study the situation. The committee comprised a forester of the Department of Lands and Forests, two industrial foresters, two representatives of the Department of Municipal Affairs, and a lawyer who was chairman. The onus was on forestry members of this forest tax committee to find a fair and reasonable means of assessment and taxation to replace the haphazard assessing done by evaluators who knew little about forest values.

The committee considered soil productivity as a means of assessment but rejected it as not necessarily indicating forest quality. Forest productivity, based on the maps of the Provincial Forest Inventory Series, was more promising. A few of the better assessors already used these maps when working under the existing Assessment Act, which was based on sale value. However, the intricate and constantly changing pattern of most of Nova Scotia's heterogeneous forest tended to make forest productivity assessment impracticable too.

In 1961 one of the industrial foresters proposed a forest yield tax similar to that used in New Hampshire and some other states. In this system the owners of commercial forests pay a percentage of the value of their forest production each year, the percentage varying according to the income required by the municipality. Representatives of the Department of Municipal Affairs strenuously opposed the yield tax but the committee majority favoured it, as did the Nova Scotia Section of the Canadian Institute of Forestry, the Nova Scotia Forest Products Association and the Nova Scotia Resources Council, incorporated in 1957.

In 1963 the government of Nova Scotia established the Voluntary Economic Planning Board, staffed by government and ably chaired by A. R. Harrington. Over 2,000 Nova Scotians from government, business and labour contributed a considerable portion of their time and efforts to this board. Shortly after the Voluntary Planning Board was established, it endorsed the forest yield tax proposal made by the Provincial Forest Tax Committee in 1961. All forestry organizations favoured the yield tax, but it was adamantly opposed by the Department of Municipal Affairs. The grossly inequitable and inefficient Assessment Act continued.

In 1971 the province appointed the Royal Commission on Education, Public Services and Provincial-Municipal Relations which became known as the Graham Commission. Among its many assignments was to recommend on forest taxation. Briefly, the commission recommended the forest productivity assessment which the Provincial Forest Tax Committee had rejected after much study more than 10 years before. In considering the commission's proposed assessment system, the Forest Tax Committee of Voluntary Planning deemed the cost of administration to be so high as to make it inequitable. Further thought along this line convinced the committee that, because of the increasingly high cost of bureaucracy, any system that required assessment of forest property or forest yield would be impracticable.

In 1975, this committee proposed a common tax per acre for all privately owned forest land. It required no assessing but merely a declaration, under oath, of the acreage held by each owner. The tax was proposed to be determined through a formula based on the estimated average yield per acre for the province; the stumpage value was to be determined as a percentage of the average pulpwood price per cord; and the tax rate was to be 2 per cent. This gave a proposed tax of 15.1 cents per acre as compared with the Assessment Act tax of 17.6 cents per acre on average in 1972 and 1974. With this proposal the saving of the cost of assessing forest lands warranted the decrease. The committee also recommended a change-in-use tax if and when the use of a forest property was changed from forestry purposes, equal to what the tax would have been for the new use for the five-year period preceding the change.

The provincial government accepted the Voluntary Planning Board's recommendations, but made some inequitable changes in the new legislation. The change-in-use tax was set at 20 per cent of the new-use value instead of the proposed preceding five-year tax on the new-use value. The act, Chapter 22 of 1977, set the common tax per acre at 25 cents annually, but at 65 cents per acre for each owner of more than 50,000 acres—a highly discriminatory practice.[17,69] The act was implemented January 1, 1978, repealing the old Assessment Act. The provincial land and fire taxes were discontinued. The new act is administered by the Province with funds distributed proportionally to the municipalities. The greatest objection to the new act is the 20 per cent of value of property taxed for change in use which is generally perceived to be too high by forest property owners, lawyers, and others knowledgeable about forest taxation. The latter group includes the Forest Tax Committee of Voluntary Planning, which recommended the equivalent of the five years of tax prior to the use change.

The Voluntary Economic Planning Board's first plan was presented to the government in 1966. This included recommendations made in 1963 by the board's Forestry Section that the Department of Lands and Forests inventory the forests of the province and maintain a continuous forest inventory. The initial inventory was to provide a statement of current and anticipated merchantable volumes by species and utilization class.

Other board recommendations included cutting practice regulation similar to those in the subsequent Forest Improvement Act, matters concerning game and fish conservation, and the game sanctuaries. The recommendations concerning forest cutting practice legislation included only harvesting to provide satisfactory regeneration, or planting suitable transplants within three years if natural regeneration was unsuccessful. They did not include recommendations for "green belts" of trees to be left standing along waterways and highways.

The Nova Scotia members of the Canadian Institute of Forestry (C.I.F.) had organized the Nova Scotia Section in 1954 with 40 members and by 1980 the membership had increased to 92. Active in all aspects of forestry, this organization was particularly active regarding forest taxation until the Nova Scotia Assessment Act was abolished and the new forest common tax per acre law was established in 1977. Another major subject was legislation respecting forest cutting practices.

The February 7, 1959 meeting of the Nova Scotia Section of the C.I.F. unanimously passed a resolution asking the provincial government to consider such legislation to replace the Small Tree Act. This resolution proposed legislation that would require cutting practices which would "provide for adequate regeneration and maintenance of growing stock of desirable species." Recommendations included provisions that where there was inadequate natural regeneration within a reasonable time after clearcutting, reforestation should be undertaken using suitable species.

The idea of leaving green belts along highways and streams was not part of this resolution nor did it emanate from committees of this or other organizations such as the Nova Scotia Forest Products Association, which supported the C.I.F. resolution.

This resolution was supported unanimously by the Nova Scotia Forest Products Association, Nova Scotia Forestry Association, the Nova Scotia Resources Council and the Voluntary Economic Planning Board. Parts of the new legislation, called the Forest Improvement Act, were proclaimed in 1965 and the act was amended in 1967, but it is still not entirely enforced, and considerable opposition to it is beginning to develop among some foresters.

The Small Tree Act had been urged upon the government by lumbermen concerned about the indiscriminate clearcutting of forests regardless of age.

Most operators showed no interest in future forest welfare; regeneration of forests of desirable species was accidental rather than planned. Before and after the Small Tree Act, thousands of acres of the forests of Nova Scotia were clearcut with no regard to regeneration. Newly proposed legislation, similar to that which has worked so well in Sweden for many years, would assure forest conservation by requiring cutting practices and tree planting that would provide prompt regeneration of forests as good as or better than those which were cut.

The Forest Improvement Act of 1965 owed much to the Swedish model. Its future success was predicated on the existence of competent, representative forest practices boards, attuned to local conditions, who would answer to a provincial board chaired by the minister of lands and forests. A number of five-man regional boards were soon in place, as well as a larger provincial board. After a promising beginning, during which the members sought to familiarize themselves and the public with their mandate and struggled to develop equitable guidelines for the province's diverse forests, the boards became inactive. In 1973 the Provincial Forest Practices Improvement Board was reactivated, and the entire province proclaimed to come under that part of the act concerning 100-foot strips or green belts bordering all paved highways. A committee of this board in time produced a comprehensive manual of good forest practice for Nova Scotia. Published in 1980, this was well received. But the act itself has proved neither popular nor workable in Nova Scotia.

WOODLAND ECONOMICS

ORGANIZING WOODLOT OWNERS

Among forest producers the woodlot owner has traditionally had very little say over the price and disposition of his or her products. Because these landowners control at least half the province's productive capacity, this has been a source of concern and contention for decades.

As Nova Scotia's forest industry expanded, woodlot owners saw new markets for their products. But as they were scattered from one end of the province to the other in thousands of small lots, an organization was needed to bring them together.

To bring this about, the Nova Scotia Federation of Agriculture looked to the Agricultural Rehabilitation and Development Act (ARDA). ARDA had been designed to provide for alternate land use, soil and water conservation, and rural development and research, all aimed particularly at alleviating the problems of low income in rural districts. Through this agreement and the Extension Department of Saint Francis Xavier University at Antigonish, the federation was instrumental in obtaining federal and provincial financial support.

In December 1966, the Extension Department entered into an agreement as the contracting agency in the ARDA project to provide organizational and educational assistance to Nova Scotia woodlot owners. Program staff consisted of a director and three fieldworkers employed by the university. As a result, 18 county woodlot owner associations were formed encompassing all the province, and the Nova Scotia Woodlot Owners' Association was established as the parent federation.

Underlying the need for the program was the unique ownership pattern in Nova Scotia. In the province there are some 30,000 individual ownerships of from 10 to 1,000 acres, accounting for 5,600,000 acres—or about 54 per cent—of the forest land. In 1967 these owners produced 55,000,000 cubic feet or about 58 per cent of the total production; but this fell to 51,000,000 cubic feet or 45 per cent in 1976. In general, these small lots are our most productive and accessible forest lands. The decreased production from these small holdings is thus hurting the forest industries.

Having had little, if any, voice in determining forest policy or marketing practices prior to this program, this sector of the forest economy now potentially had the means to exercise some influence over matters of vital concern to their continued viability. After several years of attempts at collective bargaining with pulpwood purchasers on prices, this association found that to become effective it would have to join with independent operators or contractors and truckers.

In 1979 the Nova Scotia Pulpwood Marketing Board registered the Nova Scotia Woodlot Owners and Operators Association "for all producers of pulpwood within the seven eastern counties who supply pulpwood to NSFI." On April 10, 1980, a bargaining committee met with NSFI officials to sign a collective agreement covering the price, terms and conditions under which that company would purchase pulpwood from private suppliers during the period from January 1, 1980 to July 31, 1981. This set the stage for the groups of pulpwood producers in the province.

A SENSITIVE INDUSTRY

Forestry, although its activities might seem somewhat removed from the world of everyday economics, is very sensitive to the forces of supply and demand worldwide. The pulp and paper industry is especially vulnerable to these. For lumber manufacturers such factors as the exchange rate on the U.S. dollar, interest rates and housing starts all have a direct impact. And the primary producers and those who service their requirements feel these economic perturbations as well.

Through the depression of the 1930s and until 1970, the exchange rate on the U.S. dollar was of great value to Canadians exporting to the U.S. The rate varied from time to time but it was usually at a premium, set by the Canadian government. This premium was 8.5 per cent in the first half of 1970 but then the value of the Canadian dollar was suddenly permitted to jump to parity with that of the U.S. dollar. This was a help to Canadian importers and to Canadians travelling abroad but it was a hard blow to exporters. Most of Nova Scotia's forest products are exported, and so forest industries suffered.

The Canadian dollar continued to be about equal to the U.S. dollar—and even a few points higher at times—until 1977 when it decreased to about 5 per cent lower. Then it fell to an average of more than 16 per cent lower. This shrunken value of our dollar was again a great boon for Canadian exporters and at first helped Nova Scotia's forest industries immensely. However, the benefit was short-lived. Inflation persisted, triggering a worldwide recession. Interest rates climbed to record-breaking heights, greatly reducing housing starts. Markets for many forest products weakened and became almost nonexistent for most building products. Many sawmills stood idle; most pulp industries suffered also. The Masonite plant at East River shut down for short periods several times, as did the NSFI mills at Point Tupper. The newsprint mill there was scheduled to be shut down two weeks in May and two weeks in August 1982; each time 200 employees were out of work.

Nova Scotia's highest lumber production was reached in 1947 when more than 433 million board feet were produced. This production gradually decreased, with some ups and downs, until it reached a low of 151 million in 1971. Total annual lumber production has gradually increased since 1971, reaching 205 million in 1979.[69] The highest yearly exportation of pulpwood reported by the Department of Lands and Forests was 180,758 cords in 1939. Since then the maximum reported was 149,000 cords in 1966, the last year exported wood was reported. That year, the total pulpwood production was approximately 717,000 cords of roundwood and 89,000 cords (equivalent) of sawmill chips.

A report of wood production for the year of 1979 shows totals of 1,407,000 cords of roundwood and 134,000 cords of chips produced. No details were given on the quantities exported.[69]

Fluctuations in world economies are quickly felt in Canada because this country, with about 84 per cent of its land surface occupied by forests or wild lands, is one of the world's most important forest products exporters. This forest resource supports more than 300,000 jobs directly and another 700,000 indirectly in secondary manufacturing and service industries. Direct employment breaks down as follows:

Logging	58,000
Wood industries (sawmills, etc.)	123,000
Pulp and paper	129,000
	310,000

Exports of forest products from Canada reached $12.8 billion in 1980, accounting for 17 per cent of all exports. The following is a comparison of exports and imports of forest products with other Canadian industries:

	Value ($ Billion)		
Industry	**Exports**	**Imports**	**Balance**
Forest products	12.8	1.0	11.8
Farm & food products	7.0	4.7	2.3
Fish products	1.2	0.1	1.1
Iron, steel, non-ferrous metals	12.3	6.1	6.2
Coal	0.9	0.8	0.1
Crude petroleum	2.9	6.9	– 4.0
Transportation & automotive	13.3	15.9	--2.6

Of railway cars loaded in Canada in 1980, one in eight carried forest products. In addition, forest products companies purchase large quantities of chemicals, fuel, machinery and other items which are delivered by rail. This inbound and outbound traffic contributes significantly to railway revenues.

New capital and repair expenditures in the forest sector exceeded $4.5 billion in 1981. The industry accounts for 10 per cent of the total new investment in manufacturing, and this underlines the importance of the forestry sector in generating indirect employment. The forest industry and its employees paid more than three billion dollars in taxes and resource revenue in 1979. Of this, 43 per cent went to the federal coffers and 57 per cent to the provinces.

As interest rates increased in 1981, the housing demand dropped and the lumber business started a downhill slide. By December 1981 about 30 per cent of the Canadian lumber capacity was idle. This worsened in 1982 and most forest products mills were shut down or operating in fits and starts. With the mill stoppages and the harvesting of wood damaged by the spruce budworm, there was a surplus of pulpwood in January 1982.

What was being called a recession was truly a depression in Canadian forest industries in June 1982. The *Columbia Encyclopedia* defines "depression" as "condition of a finance and industry characterized by falling prices, restriction of credit, contraction of production, numerous bankruptcies and rising unemployment."[104] All the symptoms apply to this situation except falling prices in most commodities, but these are more than offset by high interest rates and the fluctuations of the Canadian dollar. However, Bill Hatch, general manager of the lumber sales division of Abitibi-Price Incorporated of Toronto, stated in February 1982 that lumber prices, relative to costs, were the worst they have been for 50 years.

CHAPTER 48

THE INSECT MENACE

During the 1970s it became all too clear that among the forces with which forest managers must reckon, insects—especially the spruce budworm—had to be taken into account.

SPRUCE BUDWORMS

Although the spruce budworm and its various strains are native Canadian pests, and although the insect is usually present in numbers in this province, the infestations in Nova Scotia in the 1970s probably started from moth flights drifting in from New Brunswick, where there were serious infestations as early as 1952. In the 1970s the spruce budworm infestation included most forests containing balsam fir (the preferred host), white spruce and/or red spruce, and extended generally from the Manitoba-Ontario border to the Atlantic Ocean, between north latitudes 45 degrees and 50 degrees. West of Lake Huron it did not reach quite that far south. By 1980 the outbreak covered more than 100 million acres, mostly in Canada and northern Maine. This included Newfoundland, where the epidemic was probably started by moths arriving on the prevailing summer westerlies from Quebec and Cape Breton.[77,105]

In Nova Scotia the spruce budworm infestation, which had been moderate in Cumberland County and moderate to severe in Kings and Annapolis counties in 1970, severely defoliated 110,600 acres in western Cumberland County and 287,800 acres in northern Kings and Annapolis counties in 1971. In 1972 the defoliation on these areas was severe in patches. To that time, however, there was practically no damage to Cape Breton forests from this particular infestation.[69,105]

In 1973 defoliation was patchy in Cumberland, Kings and Annapolis counties and light in Hants, Colchester, Antigonish and Inverness.[69] By 1974 it was greatly reduced in Annapolis and Kings but moderate to severe on 476,000 acres in Cumberland County and severe in association with outbreaks of black-headed budworm and hemlock looper on the Cape Breton Highlands.

By 1975 the spruce budworm infestation in Nova Scotia was moderate to severe on 2.2 million acres—1.2 million acres in Cape Breton, 400,000 in

Cumberland County and 100,000 in Colchester, Antigonish and Pictou counties. There was no defoliation of spruce and fir in western Nova Scotia.[105]

In 1976 this coniferous defoliation was severe throughout Cape Breton Island and moderate to severe in the northern mainland counties. The total acreages of Nova Scotia forests affected were 1.7 million with severe defoliation, 3.5 million with moderate defoliation and 115,000 acres with light defoliation. The forests on 377,000 acres in Cape Breton were already moribund.[105]

In 1977 the severity decreased on the mainland, but the infestation was still critical in Cape Breton. It has caused severe defoliation on 1.9 million acres of Cape Breton's 2,162,000 forest acres. Dr. Richard Belyea of the Canadian Forestry Service stated that the budworm concentrations in the Cape Breton Highlands were many times those recorded anywhere else, and the most concentrated in North American history.[106]

From surveys made by the Nova Scotia Department of Lands and Forests and the Maritimes Forest Research Centre of Environment Canada, it was found that budworm infestations in 1980 covered 3,407,000 acres, comprising 31.7 per cent of Nova Scotia's total forest area. Of this, 241,000 acres were in the Annapolis Valley area, 730,000 acres in Colchester and Cumberland counties and 2,436,000 acres in Cape Breton. Defoliation was severe on 1,215,000 acres, moderate on 554,000 acres and light on 258,000 acres.[105]

From 1967 to 1977 NSFI conducted a spacing program in 4,300 acres of fir thickets which had followed Bowaters Mersey pulpwood operations at Crowdis Mountain prior to 1959. Hollis Routledge of NSFI stated that, had spraying been permitted, the more than four million treated trees destroyed by the budworm could have been harvested in 20 to 30 years. Lost too was the thinning program on the lowlands in Cape Breton involving another 4,000 acres. At about $100 per acre, the combined loss amounted to some $800,000 in silviculture besides the value of the forest growth.

Chemical spraying from the air was started in New Brunswick with DDT on about 187,000 acres in 1959. In 1964, the province of Quebec and the state of Maine joined in this aerial effort to control the budworm on extensive areas and had considerable success. Ontario also sprayed from time to time and Newfoundland undertook sizable operations in 1977-78. In New Brunswick, the forest industry and the governments were encouraged by the measure of protection afforded in the treated areas, despite the fact that there was considerable expansion of the epidemic. The object of spraying in New Brunswick was and is to keep forests green until they can be harvested by man instead of insects.

DDT, which had been found to kill some birds and other wildlife, was phased out in 1969. Other insecticide sprays were tried. Fenitrothion and aminocarb are presently the insecticides of choice and these, at the prescribed dosages, are considered quite safe except to some beneficial insects.

Despite the aerial spraying, the present budworm infestation in eastern North America is the worst in history.[106]

Insect infestations start under favourable food and weather conditions and are characterized by a rapid build-up in populations. They are stopped by adverse weather, viral diseases, parasitism, reproduction failure, starvation and, rarely, by man's efforts.

In 1981, Nova Scotia's egg-mass count—the standard measure of budworm populations—was down considerably, and it is hoped that this epidemic has collapsed. However, budworm activities since 1970 indicate that infestations can die out in different regions for a time and then rebound with disastrous effects. On Cape Breton Island there had to be a population reduction because of the extensive dead and dying forests. The reasons for reduced infestations on the mainland are not apparent.

Besides the losses discussed previously, about two million cords of spruce in Cape Breton are infested by the eastern spruce beetle, a bark insect which attacks the spruce after it has been weakened by other factors—such as budworm defoliation. Most of this spruce cannot be salvaged.

In 1981 the Province of Nova Scotia had aerial spraying done with *Bacillus thuringiensis (Bt)*, a biological spray, on 76,000 acres in Cumberland County. This expensive spray has been tried successfully because of its acceptance by the public. At present it is much too costly to apply to larger areas, however.

The extensive mortality of spruce and fir resulting from budworm devastation creates an extreme fire risk. The dead trees stand for several years, drying and gradually losing their branches and then intermittently falling. These fallen trees lie criss-crossed with only the roots and crowns of the bottom trees touching the ground; most are two to four feet above the ground and rot slowly. Thus they last 10 to 20 years with the new forest growth, mostly fir, rising in dense thickets all through the fallen trees. Such areas remain almost impenetrable for years. There are places a person can walk on fallen trees for up to 400 yards at a time without touching the ground. A fire in a dry time in such an area would be very difficult to control. For a number of reasons, then, lack of protection against the spruce budworm threatens the long-term future of Nova Scotia's forest industries.

OTHER INSECT PESTS

Birch leaf miners have caused browning of the foliage of gray birch and—to a lesser extent—of white birch, and this will probably continue. Repeated attacks by this insect can cause loss of tree vigour, but such trees generally survive for many years.

The red oak in western Nova Scotia has been generally deteriorating since the 1930s from attacks by the European winter moth, the ugly-nest tortricid and, more recently, by the red oak borer *Enaphalodes rufulus* and the oak leaf shredder and the oak leaf roller. In Queens and Lunenburg counties the shredder has been particularly active since 1974 and the leaf roller since 1980.[105] Most of the mature oak in western Nova Scotia died in the 1940s, and nearly all the oak in Queens and Lunenburg counties is in a state of decline called dieback. There has been some recent mortality and the surviving oak trees in these areas look sick.

From time to time the white-marked tussock moth has caused serious defoliation of all tree species in localized areas. In 1970, larvae of this insect caused heavy damage in Christmas tree stands in eastern Nova Scotia and in Yarmouth and Lunenburg counties. Severe attacks continued in patches throughout the province until 1977, when the insect declined markedly because of a viral disease.[105]

Present observations by the Canadian Forestry Service indicate a resurgence of the balsam woolly aphid in Nova Scotia, where it has persisted in the "gouty twig" form of attack in coastal zones since the 1920s. Balsam fir trees were heavily infested in 1970 and 1971 in many parts of central Nova Scotia and dead trees were common. In 1980, a detailed survey found the aphid active in 67 per cent of the evenly distributed stands examined. Tree mortality ranged from 4 per cent to 100 per cent, the highest being near Barrington, Shelburne County.[105]

Like the eastern spruce beetle, the eastern larch beetle attacks trees weakened by other causes. In 1979, for the first time since Hurricane Edna's damage in 1954, an outbreak of this insect killed larch in central and eastern Nova Scotia. It killed trees weakened by either the larch sawfly or the spruce budworm.

In 1981 larvae of the gypsy moth defoliated the trees on 13 million acres of forest in the United States. In the same year egg-masses of this destructive insect were found in Yarmouth, Nova Scotia. Its hosts include most species of hardwoods; several species of conifers can also be attacked when growing with hardwoods. As with so many destructive insects, this one was introduced from Europe. It was brought to the United States in egg clusters by a French scientist who hoped to cross the species with the silkworm. Some of the egg cases were lost or some larvae escaped and the species became established. It now occurs throughout the northeastern states except in northern New Hampshire, Maine, and Vermont. It is also found in southeastern Quebec and about 2,500 acres of defoliation occurred in southern Ontario in 1981.[80]

As in the European winter moth, the female gypsy moth cannot fly. The larvae spread by hanging on silken threads which are blown from tree to tree. The egg masses found in Yarmouth were apparently from adult moths transported from the United States on a vehicle or vehicles ferried from Maine. Department of Lands and Forests personnel are doing what they can to find further evidence of this species and to exterminate it here.

In the United States probably more than $100 million has been spent since 1900 to suppress the gypsy moth and to prevent its spread.[107,108] If it becomes established in Nova Scotia, aerial insecticide may have to be considered as one of the few effective methods of controlling it. The gypsy moth is one of the three most important forest pests in North American history; the others are the chestnut blight and the spruce budworm. Potentially the gypsy moth is more destructive than the budworm because it is not as selective in its diet.

The first Dutch elm disease occurrence in Nova Scotia was found at Liverpool in 1969 by J. H. Dunlop, then a member of the Liverpool Tree Commission.[109] He found two large trees affected by this disease within 100 yards of the Liverpool funeral home. His identification of the disease was confirmed by pathologists of the federal Department of Agriculture. The Town of Liverpool had the trees felled, cut into pieces, hauled away and buried. Since then there has been no sign of Dutch elm disease in Liverpool.

The next discovery of this disease in Nova Scotia was at Kentville in 1970—again in a tree near a funeral home.[105] This infection was discovered too late; the disease had already spread by elm bark beetles to other elms in the town. From Kentville it has gradually spread so that it is now found in patches in all counties of Nova Scotia except Digby, Yarmouth, Shelburne, Queens and Richmond.

The source of infection in Nova Scotia appears to have been undried, waney (i.e., sawed so near the edge of the log that there is some bark left on) elm lumber, bearing bark infested by disease-bearing beetles, used in packing cases for coffins shipped to Nova Scotia from the province of Quebec. Except for Prince Edward Island and Newfoundland, this disease has now spread in patches generally throughout the range of native and European species of elms in North America. These beautiful trees are probably doomed to extinction on this continent.

The disease was first observed in the Netherlands and northern France in 1919. It was discovered in Ohio in 1930 and in New Jersey in 1932. It appears that the fungus *Ceratocystis ulmi* was introduced to America in elm logs.[73] In

Canada the first infected trees were found at St. Ours, Quebec in 1944. By 1963, the disease was known to occur over about 46,000 square miles in Quebec and 64,000 square miles in Ontario. It was first found in New Brunswick at Woodstock in 1957.

The fungus causing the disease develops in the sap-conducting vessels and plugs them or produces a toxin that kills the tree cells. The first external symptom is a sudden wilting and yellowing of the leaves on one or more limbs, usually evident from late June to early August. Affected branches die and the condition spreads throughout the tree.

In Nova Scotia, the disease is spread by the native elm bark beetle which lays eggs in recently dead and dying elms. Young beetles emerge and fly to feed on the bark of healthy elm trees, carrying the fungal spores which start the infection.

Until recently the city of Fredericton, New Brunswick has had some success in controlling this disease by sanitation—removing and burning dead and dying trees and broken branches and removing the bark from elm stumps. Now the disease is invading from infected trees outside the city. Apparently, however, 80 per cent of Fredericton's elms are still healthy, while those of Woodstock have mostly died.

There is no known cure for Dutch elm disease. It is impossible to save a tree that has become infected.

STORMS AND SALVAGE

The peninsula of Nova Scotia lies exposed to ocean storms, some of which have wreaked havoc on its woodlands from time to time, requiring extensive salvage operations after hurricanes and winter storms, and influencing cutting practices.

Hurricanes are tropical cyclones with sustained surface winds of 74 mph or more occurring in the North Atlantic region, including the Caribbean Sea and the Gulf of Mexico. Tropical cyclones with sustained winds of 39 to 73 mph are classed as tropical storms. With energy derived primarily from the latent heat of condensation of water vapour, they generally range from 60 to 600 miles in diameter and rarely exceed 1,000 miles. In well-developed hurricanes, the speed of maximum winds has been estimated at more than 200 mph. Torrential rainfall over a considerable area is a common feature of tropical cyclones. An unusual feature is the central "eye." The pattern of winds becomes tangential to the eye boundary at a radius of some five or more miles from the storm centre, moving counterclockwise around the eye—which is the centre of air pressure lower than that of the surrounding area. The strongest wind is usually southerly and between 100 and 200 miles east of the eye.

The U.S. Weather Bureau publication *Tropical Cyclones of the North Atlantic Ocean*[110] contains North Atlantic tracking charts from 1871 to 1963, compiled from data from ships, aircraft and other sources. These charts show the tracks of the storm eyes, the dates the storms occurred and whether they were tropical depressions, tropical storms or hurricanes. Most North Atlantic tropical cyclones start over the western Atlantic Ocean or the Gulf of Mexico between latitudes 10 degrees North and 30 degrees North; during August and September many originate over the mid-Atlantic, within these latitudes, and a few just west of the African coast. Most of those originating over the Atlantic move westerly or northwesterly over the Caribbean Sea or the Greater Antilles and then swing north and northeast up the American coast or within 500 miles thereof. Some continue westerly or northwesterly across the Gulf of Mexico and move overland comparatively short distances before dying out.

Hurricane Carol in 1953 originated east of the Azores. The eye of Hurricane Carol swept over southeastern New Brunswick on September 7, 1953, passing about 150 miles northwest of Nova Scotia's south shore. This caused some damage along the southern coast and blew down some timber in patches from Halifax to Yarmouth, within 30 miles of the ocean. Most of the forest damage was in stands partially cut under the Small Tree Act regulations. On December 1 another southerly gale struck Nova Scotia when there was no frost in the ground. This was not forecast nor recorded as a tropical cyclone, but there have been a number of winter gales here which struck with little or no warning. This one blew down some trees loosened by Hurricane Edna—these are included in the total estimated damage from Edna.

A year later, on the night of September 11, 1954, Hurricane Edna's eye passed over central New Brunswick from Woodstock to Chatham. It had originated east of the Lesser Antilles. The damage in Nova Scotia from this storm was tremendous. Besides great damage to buildings, waterfronts and shipping, it was estimated that Edna blew down a total of more than 700 million board feet of timber.[111] Approximately 300,000 cords, or 150 million feet, were blown down on Mersey Paper Company freehold land, which comprised 572,000 acres at that time.

Hurricane Carol diminished to a tropical storm after it crossed the Fundy shore of New Brunswick and Hurricane Edna did the same as it passed over the eastern corner of Maine. But by the time they reached Nova Scotia, Carol was still carrying winds of over 60 mph and Edna of over 70 mph with gusts to 100 mph and rainfall of 4 to 8 inches.

In contrast to Hurricane Carol's impact, damage from Hurricane Edna was as great in previously undisturbed forests as in those which had been given a light partial cut. Most of the damage was in mature and overmature forests, but many young stands of 50 to 70 years old suffered considerably. There were areas up to 600 acres or more in good spruce forests of this age class, previously undisturbed, where practically all trees were down. Such an area was located just south of West River in what is now Kejimkujik National Park. Just south of Dennis Boot Lake in this park an entire stand of perhaps 40 acres was flattened. This was old-growth hemlock.

More than half the damage was accounted for by stands where from 20 to 60 per cent of the trees per acre were down. In extensive areas only occasional trees were damaged. Damage was heavy along margins of clearcut areas and in recent partial cuts where more than 50 per cent of the volume had been removed. Because of salt spray, foliage of some deciduous trees was darkened and that of many white pine trees turned brown inland two to four miles from the south shore. (Such spray has little effect on the foliage of cat spruce and Scots pine.)

Pulpwood production increased somewhat from salvage of Edna's damage. According to Department of Lands and Forests reports, total average annual pulpwood production from 1951 to 1960 inclusive was 276,000 cords. The exceptions were the three years following Edna's visit (1955-1957), when the average was approximately 370,000 cords. The increase in lumber production was not as great. From 1951 to 1960 it averaged 281 million board feet; from 1955 to 1957 the average was approximately 301 million. The lumber market was poor at that time.[69]

Through a period of five years after the hurricane, Mersey Paper Company salvaged just about 300,000 cords, including sawtimber, in company operations, stumpage sales and pulpwood contracts. This salvage included a number of standing trees considered to be subject to loss in following storms. On the other hand, many fallen and broken trees were not economically salvable because of inaccessibility from existing improvements or because they were too widely scattered through basically undamaged forests. The last of Mersey's salvage was in 1959. The sapwood was mostly lost due to stain and rot, but the heartwood of most of the larger trees was still sound and acceptable. Mersey put as much bleach into its pulp as possible but the newsprint paper was still pretty dingy. Fortunately, publishers accepted this paper which was not very "bright" or white.

The Small Tree Act was fairly well enforced until Edna struck in 1954. Although nearly as much damage occurred in previously undisturbed stands as in those where moderate partial cutting had been prescribed under the act, many owners attributed losses to the legal restrictions. After that, the provincial foresters were less inclined to enforce the law so strictly.

To saw spruce salvage following Hurricane Edna, Mersey Paper Company constructed its first fairly modern sawmill, electrically operated, at Sandy Lake near St. Margaret's Bay in 1954. The mill operated until 1968. An Anderson debarker was installed for debarking sound sawlogs so that slabs and edgings could be most efficiently utilized for pulpwood chips. This was the first sawlog debarker and the second utilization of sawmill waste as chips for chemical wood pulp in Nova Scotia.

In the 1970s there were three severe storms with gale—if not hurricane-force—winds in Nova Scotia. And there was apparently little or no warning of these from the weather stations. The first occurred October 20, 1974 when heavy snow and gales occurred which hit the Annapolis Valley and northern Nova Scotia the hardest. Forest damage was heavy in these regions; many buildings were damaged and some destroyed. Power and telephone lines and poles were downed and waterfront damage was severe. The second storm struck February 2-3, 1976 and was popularly dubbed the Ground Hog Day Storm. It brought snow and freezing temperatures; it damaged homes and fishing equipment and caused power failures and extensive flooding. The ground was frozen during this storm so most of the forest damage was in tree breakage rather than in uprooting. The third storm came a month later, bringing heavy wind and rain which caused extensive flooding throughout most of the province.

That year, the province paid approximately $4,000,000 for salvaging timber damaged by storms. This is the only known occasion of such assistance.

Hurricane Edna (1954) blew down a great deal of timber.

Courtesy of N. S. Department of Lands and Forest

CHAPTER 50

FIRES AND FIREFIGHTING

Modern technology and more extensive forest harvesting had both positive and negative impacts on forest fire control. On the negative side, people could now get to previously inaccessible areas and set fires—either accidentally or on purpose. On the positive side, fires could be detected earlier and, with better roads, trained firefighters and helicopters, put out sooner. The net effect was more fires but a smaller overall acreage burned.

NEW TECHNOLOGY

As radio communication, aircraft patrol and water bombing aircraft improved, so did Nova Scotia's forest fire control. By 1960 the Department of Lands and Forests had 26 fire towers and the Cape Breton Highlands National Park had two as well. In the summer of 1960 the department had four planes on aerial patrol; these planes were also used to transport men and equipment and to direct firefighting. By 1965 four more fire towers had been built and a Beaver water-bombing aircraft, owned by the Nova Scotia Power Commission, was available. During high hazard periods a navy helicopter provided assistance, as did a water-bombing plane owned by the province of Quebec.

Although helicopters first flew circa 1923, the first one used in forest fire control flew reconnaissance during a major fire near Sudbury, Ontario in 1946. By the 1960s, helicopters of all sizes were regularly used by fire agencies in many parts of the United States and Canada. In 1962 the first 100-gallon fixed mounted drop tank for light helicopters was invented and, in Canada, the first helicopter "hover fill" bucket system was developed.[112] This system was used in many parts of North America and led to the development of the 500-gallon buckets used on large helicopters. The helicopter, with its extreme manoeuverability and its ability to work in inaccessible places dropping trained firefighters in critical areas as required, proved invaluable as a supplement to traditional ground-bound firefighters and to flying fire-bomber operations.

In 1981, Nova Scotia acquired a new $1.3 million Bell 212 helicopter for fire control operations. Today, it is the largest of the fleet of five at the Department of Lands and Forests base at Shubenacadie. It has a range of 345 miles without refuelling and carries a specially trained five-man attack crew stationed at Shubenacadie with motor pump units, back tanks and other equipment. It also carries a folding 350-gallon rubberized water bucket that can be slung under the helicopter. The Nova Scotia Forest Products Association gave the province $25,000 toward the purchase of this helicopter and Bowater Mersey, Scott Paper, and NSFI each donated $100,000.

Forest fire damage has varied considerably over the years. From 1948 to 1975 inclusive the yearly acreage burned ranged from 662 to 15,062, with the area burned in most years being less than 6,000 acres. In 1964, 15 fires were reported to have started from lightning but these burned only five acres in all. Types of forest burned from 1948 to 1971 were approximately 20 per cent timber, 22 per cent young growth, 12 per cent cutover and 46 per cent barren.[69] During this 23-year period there were 394 fires a year on average, ranging from a minimum of 109 fires reported in 1948 to a maximum of 920 reported in 1968. Causes were as follows:[69]

Cause	Per Cent
Unknown	17.6
Lightning	0.9
Brush burning	11.8
Berry pickers	2.8
Railways	8.6
Industrial operations	4.4
Children	17.2
Smoking	6.3
Incendiary	16.2
Campers	4.2
Buildings	2.8
Fishermen	6.9
Garbage dumps	0.2

In Canada, the forest fire season of 1980 was the worst on record. An estimated 119,189,000 acres were burned in 8,973 fires—an average of 1,528 acres per fire. The greatest acreages were in northern Saskatchewan and the Northwest Territories where accessibility is very difficult. But Ontario, Manitoba and Alberta suffered heavy fire losses too. That year, Nova Scotia had 439 fires which burned 2,420 acres—an average of 5.5 acres per fire. John Gass, then Manager of Forest Protection for the Department of Lands and

Forests, stated that the province averages 600 fires and loses about 5,000 acres to fire each year. However, in 1981 only 896 acres of woodland were destroyed by 449 fires—an average of only two acres per fire.[69]

According to the Toronto *Globe and Mail*, December 12, 1981, the fire season that year was worse for Canada than that of 1980, when the area burned was five times as large as that harvested by forest companies.

Total forest protection costs paid by Canadian governments and industries were estimated at $230 million in 1981, of which $120 million was earmarked for fire suppression. Nonetheless, the average annual loss from fire, insects, and disease still equals about two-thirds of the annual harvest.

ARSON

Nova Scotia has had more than its share of incendiary forest fires. According to the Department of Lands and Forests reports, from 1927 to 1932 an average of 37.8 incendiary fires occurred per year, burning an average 1,613 acres yearly. In 1933, 130 incendiary fires burned 8,024 acres and in 1934, 82 such fires burned 8,035 acres. The sharp increase in incendiarism in 1933 and 1934 may have been due to men starting fires to get employment fighting them. From 1935 to 1963 the number of incendiary fires reported annually ranged from 8 to 59, burning from 156 to 8,539 acres per year. In 1964 there were 92 such fires reported; in 1965, 153; and in 1968, 172. After 1955, fire control had improved to the point where the maximum acreage burned from incendiary fires in any year was 4,051 in 76 fires (1976) or 53.3 acres per fire.[69]

The worst such incident known in Nova Scotia appears to have stemmed from one man starting fires on an area of less than four square miles west of the lower Mersey River and Liverpool Harbour between 1954 and 1957. Although the Department of Lands and Forests reports indicate fewer incendiary fires in all of Queens County for these years, it is believed that there were at least nine on this particular area in 1954, 10 in 1955 and 10 in 1957.[113] No such fires occurred in the summer of 1956 because it was a wet summer. Besides the number of fires considered to have been incendiary, at least two of unknown origin occurred in this area which may also have been arson.

The worst of these fires was started about 2 p.m. on Saturday, May 20, 1955 near Town Lake, one and one-half miles southwest of Liverpool. It ran about a mile easterly to Highway No. 3 that afternoon, leaving a front along the highway two miles long with some unburned patches. Sunday morning was hot with a strong westerly wind and the fire ran rapidly to the ocean, extending seven and one-half miles along the shore from just east of White Point Beach to within a mile of Liverpool on Liverpool Harbour. In places the fire reached within a quarter mile of the town. It burned 7,000 acres, mostly young growth and barrens on land burnt over in previous fires. A number of utility poles were burned into two or more pieces by embers striking the poles and burning right through them. Had the wind been a little more southwest, most of the Town of Liverpool would have been destroyed.

By May 23 the fire was thought to be completely extinguished but a part of it flared up again on the afternoon of May 24, crowning in a small softwood stand and threatening homes on the south side of Liverpool. Fortunately, Mersey Paper Company forestry personnel got to this fire quickly with adequate equipment and extinguished it before it could reach any buildings.

This 7,000-acre fire destroyed 15 homes, 4 cottages, 3 cabins, 20 barns, 1 dance hall and canteen and 25 other buildings. Also destroyed were 13 fishing boats—mostly Cape Islanders at Moose Harbour—100 nets, 8 wharves, 15 fish shacks and 500 lobster traps. There was only one known casualty.[113] Despite this holocaust, two years later the arsonist was still at it, setting 10 fires in the dry year of 1957. Lands and Forest personnel did all they could to apprehend him but he always managed to elude discovery.

In the fall of 1957 the Department of Lands and Forests erected a fire tower overlooking this area—and there has not been a fire there since.

SALVAGE OF FIRE-DAMAGED WOOD

Five hundred and forty-one fires burned 43,331 acres in 1976, the greatest acreage burnt in Nova Scotia in any year since 1947. One fire, near Trafalgar, Pictou County started June 4 and destroyed 32,800 acres. It cost the province about $700,000 to extinguish this fire. That weekend, three other major fires broke out as did about 25 smaller ones in Nova Scotia.

The Trafalgar (pronounced *Tráfalgar*) fire area included approximately 15,600 acres of cutover land, much of it bearing good regeneration. About 2,200 acres comprised bog, barren and swamp; about 15,000 acres were wooded. Most of the area burned was controlled by Scott Paper Company and NSFI. Scott salvaged 3,500 cords of pulpwood and about 14 million board feet of saw timber. The latter was sold to 38 sawmills in the province. NSFI salvaged over 50,000 cords of pulpwood from its burned licensed Crown land. This company also cut about 1.3 million board feet of sawlogs, but found so much deterioration that the wood could not be sold at a profit. Both companies were conducting site preparation and tree planting on the burnt areas in 1977 and 1978.

CHAPTER 51

CHRISTMAS TREES

Markets for Christmas trees improved dramatically as growers learned to produce better quality trees, especially balsam fir. Extension services provided by the provincial and federal governments played a key role in the success of this small but vital industry.

Balsam fir, with its fragrant, durable, glossy dark green foliage, is the world's most popular Christmas tree. Nova Scotia trees of this species have long been shipped to various parts of the eastern and central United States, and more recently to the Caribbean islands, South America, Germany and Iceland.

Prices paid to Nova Scotia Christmas tree producers in 1976 ranged from 40 cents to four dollars each for trees 4 to 10 feet tall. Until the late 1960s most trees were shipped to the United States by rail, but by 1975 nearly all were transported by truck. Until a few years ago, Nova Scotia trees were trucked to New York and then loaded on ships for overseas market. The 1975 harvest of approximately one million trees was valued at $1.5 million. The 1976 production was down slightly because of damage in various parts of the province from the spruce budworm, the tussock moth and the balsam midge. Although balsam fir is the only host of the balsam woolly aphid in Nova Scotia, this insect is usually not a Christmas tree pest. The aphid does attack small trees but generally only where they are beneath older infested trees—which is not a suitable location for growing Christmas trees in any case.

The overall Nova Scotia Christmas tree production dropped every year between 1960 and 1976. While some of this decrease was the result of insect attacks, much of it was due to the shipment of low quality, uncultivated wild stock. Moreover, artificial trees and United States plantations of Douglas fir, Scots pine and other species were increasingly monopolizing the market.[69] In the late 1960s, Nova Scotia producers realized that to save their industry they must improve tree quality. With help from the Department of Lands and Forests and the Canadian Forestry Service they developed methods to accomplish this. In Nova Scotia, 95 per cent of Christmas tree lots are natural stands which followed clearcutting of the overstorey. In such stands, spacing or thinning is necessary and some planting is required to fill vacant areas. Both in plantations and natural stands, weeding, fertilization, pruning and shearing are essential. Shearing is started when a tree is three or four years old and is done each year until it is harvested. Christmas trees range from 1,200 to 2,000 pe acre in a managed stand. Most growers plan their crops so there will be som trees ready for harvesting each year, taking about 100 trees per acre.

In 1977 some 1,164,936 trees were exported and another 45,736 sold i Nova Scotia retail yards. Of these, 67.8 per cent were produced in Lunenbur County. Of the exported trees, only 1,050 were pine. But of those retailed i Nova Scotia, where red pine is preferred by some people, 5,090 were pine an 307 were other conifers.[69] A tree which brings a Nova Scotia producer $8 ma be retailed for $30 in New York or Chicago.

Lunenburg County—now called "The Balsam Fir Christmas Tree Capita of the World"—has approximately 40 companies exporting Christmas trees. Some of the larger exporters ship as many as 300,000 trees per year. Accordin to the *Chronicle-Herald* of September 29, 1980, there were more tha 1,500 producers within a 30-mile radius of Bridgewater, and they brough more than three million dollars into the local economy annually.[114] Abou 3,000 growers in the province own anywhere from a few acres to severa thousand acres of Christmas tree land.

The largest number of Christmas trees ever to be shipped from Nov Scotia left Bridgewater in November 1980 on the M.V. *Grootsand*. The carg was 55,000 balsam fir trees bound for Venezuela. A second ship took anothe cargo to Venezuela and a third one carried a load of Christmas trees to Puert Rico. The shipments comprised trees from the Hibbert Keddy and H. C Sanders & Son yards; shipping arrangements were made by Atlantic Trader Company of Halifax.

Today, Kirk Limited, under the management of Charles Yeaton of Ne Germany, is Nova Scotia's largest exporter of Christmas trees.

10 OVERVIEW

In which the author offers a critique of clearcutting, a primer on the silvics and management of Nova Scotia's native trees, a perspective on climate and a parting comment.

SILVICS AND SILVICULTURE IN THE 1980s

It would be a serious omission not to comment in this treatise on some aspects of silviculture.

CLEARCUTTING AND OTHER SYSTEMS

As previously discussed, clearcutting of extensive areas in Nova Scotia is second only to fire in being detrimental to the ecosystem, and the greater the percentage of biomass removed, the worse it is. Even where logging debris is left following clearcutting, soil fertility is reduced. Nitrate concentrations in all streams in watersheds which had been clearcut on an experimental area in New Hampshire rose to a maximum 25.1 mg per litre two years after clearcutting. Calcium concentrations rose to maximums of 6.5 mg per litre either the first or second year after cutting. Both nutrients generally returned to reference levels of uncut areas within five years, however.[98]

As long as adequate forest cover continues, most sites in Nova Scotia will remain static or improve but the general tendency following clearcutting or fire is towards deterioration, even where planting is undertaken. As mentioned before, in western Nova Scotia clearcutting and fire have resulted in the transition of about 500,000 acres from productive forest land to heath land.[115] As clearcutting continues in succeeding forest generations, the acreage thus degraded increases. This is generally in small patches of a few acres each at first, but subsequent clearcutting or burning tends to enlarge and join these patches.

Studies of this situation have been conducted off and on by the Canadian Forestry Service and the Nova Scotia Department of Lands and Forests since O. L. Loucks of the Forestry Service started work on the barrens of Yarmouth and Shelburne counties in 1960.[116] It is recognized as a serious problem and recommendations have been made for further research with the object of increasing wood fibre production in western Nova Scotia. Scotland had a similar problem of long standing; however, at considerable cost, established excellent coniferous forests on heath lands there. It is realized that funds are not available during the current depression for further work on this problem in western Nova Scotia, but this province needs every acre of productive forest available. If there is any chance of duplicating Scotland's success, the federal and provincial governments should make every effort to do so as soon as possible. In the meantime, the Forest Practices Improvement Board and the Department of Lands and Forests should be particularly cautious about permitting practices on fragile sites in western Nova Scotia that would lead to transition from productive forest land to heath land. Western Nova Scotia in this instance includes the seven counties west of Hants and Halifax counties. The transition to heath apparently does not occur on the relatively fine-textured soils of O. L. Loucks' LaHave Ecoregion in eastern Queens and western Lunenburg Counties.[116]

According to Loucks, forest lands in his Maritime Lowlands Ecoregion are headed for similar heath troubles. This Ecoregion includes the Northumberland Shore—Oxford districts, Windsor-Truro-St. Mary's districts and the Sheet Harbour district. In areas of repeated disturbance, witherod and rhodora already monopolize the sites.[116] Other aggressive shrubs include sheep laurel. Clearcutting and planting in these ecoregions and in western Nova Scotia will require considerable liming to maintain productive forests.

Water—good clear fresh water—is becoming an increasingly valuable commodity. It will likely someday supersede crude oil in value. But clearcutting, even that followed by planting, reduces the clarity and value of water. After clearcutting, annual stream flow has increased as much as 50 per cent. After reforestation, annual stream flow has decreased as much as 85 per cent. The increased flow after logging gradually decreases as the forest becomes re-established. In one case, 35 years elapsed before flows fell to pre-logging levels.[117] Peak or freshet flow has increased as much as 21 per cent, usually in the spring of the year, and low flow in dry periods by 90 per cent in some cases. "As forest cover on a watershed is reduced, erosion increases. Losses because of the erosion include the productive land and the damage caused by the movement of eroded materials, but of more importance here is the water quality deterioration caused by the sediment produced."[117]

Careful planning and placement of roads are essential. In one study, sediment concentration in a stream from a partially cut area with well-planned skid roads was 25 parts per million. From an adjacent clearcut area with little road planning, sediment concentration was 56,000 parts per million.[117]

Because of organic litter and tree roots, forests maintain high infiltration rates. But these rates can be altered considerably by logging methods. Heavy logging equipment and roads compact the soil, lowering the infiltration rate. When rainfall exceeds this rate, the excess water flows overland, reaching streams faster than water which percolates through the soil to the groundwater table and then to the stream. It causes higher peak flows, greater erosion and higher sedimentation of streams as well as lower water levels in dry times. Summer water temperatures reach high points and stream fish either move out or die.

In his study of forest regeneration in 1951, R. H. Candy stated that, in eastern Canada, reproduction to conifers on areas disturbed by logging only (clearcutting) was most encouraging. But he took the stand that balsam fir is a valuable species and he found fir dominating the conifers on nearly all of his quadrat samples. The stands cut had been mature and overmature. Reproduction following cutting of young stands was unsatisfactory, he stated.[118] Coniferous regeneration on areas cut and then burnt was either a complete failure, or at best was understocked. The fire hazard on clearcut lands is much higher than on partially cut areas because of the dry logging debris for five to ten years after cutting and inflammable coniferous thickets for the next 10 to 20 years.

Foresters have long cried out for multiple use of forest lands, opposing establishment of extensive parks where forests are to be inviolate by man forever. Clearcutting and planting now provide for the single use of forests to the other extreme.

In 1972, the Science Council of Canada stated:

> In general, it has been recognized that forest land should be managed for sustained yield of many commodities and values, including fibre, wildlife, water and recreational use. There nevertheless remain instances of clearcutting over large areas, for which natural regeneration is inadequate and in which planting programs are falling behind cutting rates. Each year at present, an average of about 500,000 acres of potentially productive cut-over and burned-over forest land [in Canada] is not reforested. In consequence, the quality of the environment deteriorates and, in many places, plant cover is insufficient to prevent soil erosion. Additionally, the industry is characterized here and there by poor practices of road building, carelessness in preventing stream blockages, thoughtlessness in the disposal of wastes, poorly planned slash burning, and many other examples of primitive forest harvesting technique. Undoubtedly, the pattern of forest land use is improving, but it is important to realize that it will become crucial, as we rapidly approach the upper limit of capacity for sustained yield of all the commodities and values of our forests.[119]

Planted monoculture forests provide poor wildlife habitat and, although clearcutting does produce an abundance of food for wildlife, the food usually becomes unavailable in a short time. This is particularly true if the regrowth is sprayed with a herbicide. Extensive clearcut areas deprive deer of the shelter they require, and uncut or partially cut areas must be left at strategic locations if they are to survive.

Over the millenia, nature devised a means of providing a mix of fertilizers from deep soils—which are untapped by the roots of most conifers—by producing pioneer hardwoods to precede the softwoods after denudation of land. As in most cases with nature, an overabundance of these are generally produced, and new forests established after clearcutting usually require some cleaning of these deciduous weed trees, so-called. However, with their deep root systems, a reasonable mixture particularly of yellow birch and red maple should be left distributed in coniferous stands to provide soil nutrients more efficiently than any other system of forest fertilization.

Clearcutting and planting is now considered by many foresters as a panacea for all Canadian forests. What is not realized is the remarkable succession ability of red spruce (which is at its best in succession management), and the fact that planted forests are far from being free of trouble.

> The forests of Scandinavia, the southeastern United States and the British Columbia coast are frequently extolled as models for all Canada. However, I believe that, while these models are useful as inspirations since they exhibit what can be done, the true form of intensive forest management in Canada will be shaped more by our own particular circumstances than by those of other countries or even other regions within Canada.[120]

West Germany, generally recognized as the epitome of good forest practice, and Sweden both find it increasingly necessary to add fertilizer to the soils of the forests which are clearcut followed by planting. Most of the cutting in Germany is in small patches of about 2 to 10 acres. All of the planting is monoculture and it is largely Norway spruce and Scots pine but white pine, white oak and European beech are also planted. This clearcutting in small patches is much better ecologically and hydrologically than the clearing of large acreages as practiced in Nova Scotia now.

Mountain sides and hillsides in Germany maintain selection forests. The forest road systems are excellent in West Germany and heavy trucks travel these roads, but there is practically no heavy off-road equipment used in most parts of Germany. This is also better hydrologically than much of the logging in Nova Scotia now.

Those who think planted forests are free of storm damage are sadly mistaken. In January 1982 there was extensive damage in the West German forests, as bad in those planted as in the selection forests. In both cases the fallen and broken trees were mostly salvaged at high cost.

With all the marks against clearcutting it is nevertheless the only practical harvesting method that can be applied with some forest types and conditions. All forests comprised of 50 per cent or more of overmature or decadent trees should be clearcut and other conditions requiring clearcutting are discussed under individual species below.

PINES

In the eighteenth and nineteenth centuries, white pine was the most important timber tree in Pictou County, but there are few pines there now. There is still good white pine in Cape Breton where 3.7 per cent of the forest area is white pine in association with red and/or black spruce and 0.3 per cent is in pure white pine stands. The lower four or five feet of the kitchen walls in many of the old farm homes in Cape Breton were comprised of pine boards two or more feet in width.

Widely scattered trees of this species may be found almost anywhere in the forests of this province, but now only 5.5 per cent of the total forest area is listed as containing 20 per cent or more of white pine and only 1.1 per cent of the total area is in pure white pine stands. It occurs mostly in the South Shore, Valley and Western subdivisions of the province in various associations with other species. It grows on most Nova Scotia soils but it is at its best on well-drained sandy soils. It will commonly reach 200 years of age if undisturbed and the maximum age may exceed 450 years.[79] Height and diameter growth of dominant trees is more rapid than that of most other species here.

A white pine tree cut in Pennsylvania in 1899 was reported to be 12 feet in diameter at the butt and 200 feet tall.[79] Trees of this species growing to 24 inches or more in diameter at breast height (dbh) and 100 to 110 feet tall are not uncommon in western Nova Scotia. In this province the dominant white pine tops tend to lean towards the northeast because of the effect of the prevailing southwest wind. White pine trees are generally shorter in Nova Scotia than in other mainland parts of the species' range.

The largest tree of this species known in Nova Scotia in recent years was cut near South Milford, Annapolis County by J. H. Hicks & Sons of Bridgetown in 1950. It scaled 3,300 board feet and sawed 2,740 board feet. The butt logs were too large for the Hicks sawmill and there was some loss in splitting with dynamite. The butt log topped 48 inches at 12 feet above the stump. A white pine 37.6 inches dbh and 78 feet tall at Waugh's River, Colchester County was reported in the 1970s by L. Cameron.

Red pine, a native tree here but often called Norway pine, now comprises only 0.3 per cent of the total gross merchantable volume of the forests of Nova Scotia. Used for boat boards and for creosoted poles and piling, most of it was cut before 1960. However, it is one of the most successful species for transplanting. It comprises a high percentage of the new man-made forests and many of these will reach merchantable sizes by the year 2010. Red pine is at its best on well-drained sandy soil but will thrive on poorer soil than will white pine. It is rarely found in swamps. It is an extremely rare species on the eastern mainland but scattered trees may be found in Cape Breton. Pure red pine stands occur in the North Central, South Shore and Western divisions of the province and there are some fine pure red pine stands in Kings County. Altogether, such stands are reported to cover 0.4 per cent of the total forest area there, and this species, in association with red spruce and red maple, and with jack pine, comprises 0.3 per cent of the total forest area of Nova Scotia.[98] Red pine also occurs in association with white pine.

Having stiffer twigs and branches than white pine, red pine is not shaped by wind as is white pine. The growth rate of dominant red pine is almost as good as that of white pine and, while it has insect and disease enemies, it is less susceptible to such damage. However, Scleroderris canker, first found in Nova Scotia in the late seventies, is a serious fungus disease in red pine and jack pine plantations elsewhere. Although widespread in New Brunswick and in most of the northeastern states, it has caused little damage in Nova Scotia yet. But it is being watched with apprehension by foresters.

Red pine is less shade-tolerant than common associates such as white pine, spruce, balsam fir and hemlock, but it is more tolerant than the aspen, jack pine and white birch. Beginning at about 25 years of age, red pine prunes itself better than most northern conifers.

The oldest age recorded for this species is 307 years in Minnesota, where red pine trees have reached 150 feet in height and 60 inches dbh.[79] The largest red pine known in Nova Scotia was measured for a competition held by the Forest Technicians Association in recent years. It was 25.5 inches dbh and 92 feet tall, but red pine rarely reaches 24 inches dbh here now.

As with white pine, the seedlings and saplings are wiped out by fire, but with advancing age red pine becomes more fire resistant than even white pine. This species can best be managed by shelterwood cutting but planted stock on sandy soils does very well.

Jack pine, common in much of New Brunswick, comprises only 0.2 per cent of the total merchantable volume of the forests of Nova Scotia. It occurs in pure stands in the North Central district only and is found in association with the spruces, with red pine, with spruce and fir and with spruce and gray birch. It is more common in the North Central district than elsewhere but it is listed as being in all districts except the Valley and Cape Breton.[98] However, it does occur in association with spruce and fir in Richmond and Victoria counties. On the Canso and Peggy's Cove barrens, jack pine is found growing to heights of only two or three feet.

This species has serotinous cones, some of which may remain closed 25 years or longer. Intense heat, such as that of a forest fire or solar heating near the ground where temperatures exceed 80 degrees Fahrenheit, will open the cones. Cones on trees can open and produce viable seed at temperatures as high as 600 degrees Fahrenheit.[79]

Jack pine is used for pulpwood and low grade lumber; in silviculture more valuable species should be favoured. Stands tend to break down after 60 to 100 years but vigorous trees 185 years old, 20 inches dbh and 100 feet tall have been found in Minnesota. The oldest tree known, 230 years old, was found at Lake Nipigon, Ontario.[79] It is doubtful if they reach more than 20 inches in diameter and 90 feet tall in Nova Scotia.

SPRUCES

White spruce and black spruce have almost identical ranges, spanning the continent from Alaska to Labrador and Newfoundland and from the northern tree line to the U.S. border, except along the west coast and in the prairies. In general they extend into the U.S. only in the Lake States, the Adirondack Mountains and the New England States. These and larch or tamarack are North America's hardiest conifers.[79]

As of 1965-71, white spruce comprised 7.0 per cent of the gross merchantable forest volume of Nova Scotia, with the largest concentration being in Cape Breton followed by the Annapolis Valley and the eastern Subdivision. Pure stands covered 9.0 per cent of the forest area of Nova Scotia, and in associations with other species, it was found on an additional 3.8 per cent.[98] Most of the pure white spruce stands developed on abandoned farms. Although the trees on some of these sites are clean and well-formed, most of them are very limby. Because of the odour of the foliage, they are often called cat spruce. It is amazing where the seed comes from to develop these old-field stands, for hardly a white spruce tree can be found for miles around in some cases.

In 1957 M. H. Drinkwater of the Canadian Forestry Branch reported some 500,000 acres of this old-field spruce type in Nova Scotia. The 1965-71 provincial forest inventory indicated about 400,000 acres of this forest type. Compared to the 1958 inventory there was an apparent volume shrinkage from approximately 11,887,000 cords to about 7,541,000 cords.[98]

The old-field spruce in Nova Scotia grows rapidly, averaging about a co per acre annually to 40 to 60 years and then these stands deteriorate quickl usually from attack by the eastern spruce beetle or, less often, by the spru budworm. White spruce is second only to balsam fir as the preferred host the budworm. A large percentage of the more than three million cords in Ca Breton has died from budworm defoliation since 1979. Much of that whic survived budworm attacks has been, or soon will be, lost to the beetle. Th insect is now increasingly active on the mainland, where it is attackir overmature red spruce and white spruce.

Scrubby white spruce borders most of the coast of Nova Scotia from t New Brunswick border along the Fundy shore (excepting the northeast a southern shores of Minas Basin), around the western end of the province, a along the South, Eastern and Cape Breton shores to Glace Bay. It covers mo of the islands along the coast and it is apparently impervious to salt spray. Mo of this spruce along the coast is too limby to be merchantable but this ty extends up to 20 miles inland in places, with some improvement in tree qualit Considerable knotty pulpwood and some lumber has been produced from it.

Generally there is insufficient regeneration beneath either old-field spru stands or the shore spruce to provide satisfactory new forests after mortality cutting. When such forests are eliminated the land is usually covered for son years by raspberries and/or other brush and weed hardwoods with son balsam fir. Clearcutting and planting appears to be the best silviculture for th type, but weeding is costly. Cutting should be done before stands rea 60 years of age.

In Ontario white spruce grows to more than 20 inches dbh and 110 fe tall with good clear boles in from 90 to 150 years and in Alaska it does ev better. In 1866 Ovide Brunet reported a white spruce near Rimouski, Queb to be 48 inches diameter and 100 feet tall. Other maximum sizes reported e of the Rocky Mountains range from 20 inches to 46 inches dbh and from 85 150 feet in height.[79]

From the time the author first studied the taxonomy of northeaste forests, there were many trees he could readily identify as red spruce and ma as black spruce, but there were many spruce trees which left him uncerta Now it is recognized that these two species commonly hybridize. And in t provincial inventory of 1965-71 they are sensibly combined under the name spruce.

The range of black spruce includes most of Canada to the northern tr line while red spruce is confined mostly south of the St. Lawrence River a Gulf of St. Lawrence in Quebec, the Maritime Provinces, the New Engla States and New York State, with patches extending south to Tennessee a North Carolina in the Appalachian Mountains. The range of red spru excludes northern New Brunswick and the Gaspé Peninsula but includes a strip 60 miles wide north of the St. Lawrence River from the Ottawa River to Murray Bay. There is also a comparatively large area in southeastern Ontario.[79]

Combining red spruce and black spruce as just spruce, they are now the two most important tree species in Nova Scotia from every viewpoint. They comprised over 30 million cords or 28 per cent of the total merchantable volume of the forest as of 1965-71, up from 23.8 per cent in 1958. According to the 1958 inventory, black spruce comprised 20.3 per cent of this spruce combination.

Pure spruce stands covered 13.4 per cent of the total forest area as of 1965-71 and on an additional 7.2 per cent of the total forest area spruce was found in association with other species, where it comprised more than 20 per cent of the stand volume. About half the spruce stands are on land holdings of less than 1,000 acres and the other half have about equally divided between the Crown and the owners of larger holdings.[98]

Until the late 1930s, expert taxonomists refused to believe that red spruce occurred in Cape Breton but they became convinced. The 1958 forest inventory showed 7.1 per cent of the gross softwood volume in Cape Breton as being red spruce.[98]

Rarely exported before 1820, spruce lumber replaced white pine as Nova Scotia's most important commercial tree species before 1900 and it now has many uses, notably pulp, paper and lumber. Black spruce fibre is the best wood fibre in the world for paper making and red spruce is a close second. Spruce sawtimber stumpage values averaged more than $40 per thousand board feet in 1980 and good quality spruce pulpwood more than $15 per cord.

Red spruce is a medium size tree at maturity, reaching 16 to 30 inches dbh and 70 to 98 feet in height in Nova Scotia at from 150 to 280 years of age. The largest red spruce on record, reported from the southern Appalachians, was 57 inches in diameter and 165 feet tall. Maximum age is reported to be about 400 years.[79]

The largest red spruce reported in Nova Scotia was 31.8 inches dbh but the height was not given. This tree was at Falmouth Mountain, Hants County. One of the tallest red spruce reported was east of Big Indian Lake, Hants County. It was 25.9 inches dbh and 98 feet tall in 1974. Another of the same height was 18.4 inches dbh.

In 1980 McCully & Soy Limited had a disc of red spruce which had been cut in 1951 at Refuge Cove on Cape Chignecto, Cumberland County. This had more than 345 annual rings and was only about 15 inches diameter, excluding bark. The oldest red spruce examined by the writer was 272 years old, 30.5 inches dbh and 90 feet tall. This was at Five Mile Lake, Hants County in

1931. Another Hants County red spruce was cut on Bowaters Mersey Paper Company land in the St. Margaret's Bay district for Expo '67 in Montreal. This was 30 inches in diameter at the butt and 98 feet tall. It was nearly 200 years old and contained approximately 1,000 board feet.

Red spruce is a very tolerant succession species and seedlings get their best start in partial shade. Often there are thousands of seedlings per acre under mature forests but they do not survive heavy shade—that is, where there is less than 15 per cent of full noon sunlight. On the other hand, seedlings starting in the open undergo heavy initial mortality as the result of high surface temperatures, drought and frost heaving. Transplants also suffer this fate at times but few losses occur in the open after the new plants are three years old and well established.

Red spruce seedlings and the commonly associated balsam fir are simila in many ways but the fir has longer roots in the seedling stage, reaching mor deeply into mineral soil. The fir, therefore, generally survives open condition which often kill the spruce seedlings. In Nova Scotia, red spruce seedlings an advance growth generally survive shade better than that of balsam fir and othe species.

Under suppression this spruce retains for many years the ability t respond to release, but vigour of response may decline somewhat with age. is a climax species here.

Now that the forest industries and the federal and provincial governmen realize that forests cannot be cropped by clearcutting continuously witho some input, millions of dollars are being spent on silviculture in Nova Scot Intensive forest management is the theme. The current fad is to clearcut a plant, now largely red spruce because it is recognized that this is the provinc best all-round species.

The Nova Scotia Department of Lands and Forests and the for industries are increasing forest nurseries from 8 million transplants in 1980 28 million in 1982 and are changing the species produced from the 1 preponderance in red pine to an 83 per cent dominance in spruce. Red spr and black spruce are to be grown in nearly equal quantities and black spr will dominate in highland plantings.

Bowater Mersey has established a 123-acre seed orchard in eas Annapolis County to produce genetically improved spruce seed for the growing, high-volume "super trees" or "plus trees" of the future. Accordin Woodlands Manager Leif Holt these trees will grow taller and yield 15 per greater volume than natural trees in a shorter period of time. The culture planting of the progeny of these "plus trees" is considered tops in the There is no doubt that some trees of a given species are of better genetic qu than others. But it is also true that many of those being selected as plus trees are such largely because they had better opportunities than their neighbours. In fact, many of Bowater Mersey's plus trees are being found in stands which were partially cut under the selection system between 1946 and 1965. As indicated by the annual rings, practically all of the plus trees grew slowly at their start and many had one or more periods of slow growth after that. This indicates that they started as an understorey and had periods of competition from their neighbours as they grew.

Because of its propensity for partial shade in early life and its ability to respond well to release, the best and least costly silviculture for red spruce is partial cutting. D. P. Fowler of the Canadian Forestry Service stated that most trials of red spruce have demonstrated that the species is not well adapted to plantation forestry. He wrote that it is "a late successional, shade tolerant species, best adapted to regenerate in competition with, and protected by, other less tolerant species." He recommended shelterwood, selection, or patch clearcutting.

I. C. P. Millar of the Canadian Forestry Service wrote that good site selection and management of red spruce will generally provide a yield superior to that of other local species. Millar also compared costs of artificial regeneration, typically in excess of $222.50 per acre, with shelterwood cutting, which has been done for approximately $36.40 per acre.

According to Sandy MacGregor of Scott Paper Company, that company started shelterwood, release cutting and thinning in 1977 and by 1981 these treatments extended over about 2,000 acres annually. He said it was costing Scott $48 per acre for shelterwood cutting and $250 to plant clearcut areas. Another cost to be added to artificial regeneration is weeding. MacGregor stated that the use of herbicides is necessary on a minimum of 30 per cent of Scott's planted acreage.

If herbicidal weeding costs are added to planting costs after clearcutting, the total amounts to from $257.50 to $320.00 per acre as compared to $36.40 to $48.00 per acre for shelterwood cutting. Is planting worth it?

No wonder spruce stumpage cost $9 per cord Canadian in Sweden in 1964. This is more than $24 per cord in 1980 dollars. Nearly all of Sweden's forests are planted and one wonders what the stumpage costs are in Sweden now.

Besides the lower cost of regeneration in shelterwood cutting there is increased growth in the residual stems of the overstorey. But there is some risk of storm damage, which should be slight if less than 40 per cent of the merchantable volume has been extracted and if vigorous trees comprise the standing residue. Harvesting vigorous red spruce when it is less than 70 years old wastes the most productive part of its projected life. It is like retiring a vigorous person at 30 years of age.

In undisturbed even-aged forests, there is a period of suppression fro
20 to 70 years and the average red spruce has a dbh of 7 inches at age 70.
about this age, red spruce stands have thinned themselves and the survivi
trees will have average diameter growth of about two inches per decade.

This increased growth can be started much earlier by thinning or cleani
and spacing to 6 feet by 6 feet in immature growth 6 to 18 feet tall. Howev
incautious thinning can result in severe losses in spindly saplings a
experimental spacing at different intervals should be tried on small areas first.

In intensive forestry, such thinning should be done about 20 years af
clearcutting or after partial cutting and may cost $200 per acre. However,
shelterwood or selection cutting, extraction of residual merchantable trees
successive cuts automatically partly thins the new growth so that the manu
thinning cost is lower than that following clearcutting.

In a recent issue of the *Journal of Forestry*, Richard Plockman,
prominent German forester, stated that the rotation of spruce in Germany
approximately 100 years. This is in planted forests where both low thinnin
and high thinnings have been made before the harvest of the century-old stan

Maintaining uneven-aged red spruce forests comprised of trees fr
seedlings to 150 years old is the most efficient way of growing top qual
wood fibre in Nova Scotia. High thinning—thinning from above—in su
forests can be done more profitably than low thinning. After the first h
thinning, which removes defective trees, balsam fir and other less desira
trees, subsequent partial cuttings may be made at periods of years equal to
per cent of the volume of the stand removed divided by 2.5. This rule of thu
is a guide but closure of crown cover is a better indication of the time to ma
the next thinning. This is selection cutting.

Not more than 40 per cent of the stand volume should be removed in
partial cut and, operated conservatively and barring catastrophe, red spr
forests can be maintained perpetually, yielding 1 to 1.5 cords per acre annua
"Plus" trees become common under this system.

In their article concerning the selection system in spruce-fir stands, Fr
and Blum state:

> Stand quality is improved, species composition can be altered, diame
> class distribution approaches a stated goal, stand density is controlled
> yields are increased.[121]

Mersey Paper Company's tree-marking cost in 1950 averaged 11.3 c
(about 38 cents in 1980 dollars) per cord, but with trained logging supervis
this cost can be eliminated.

Forests adaptable to such cutting include even-aged stands 70 to 120 years old as well as uneven-aged stands. Unfortunately, there were only 458,530 acres of softwood and 260,050 acres of mixedwood in these age classes in 1965-71 and these types included extensive areas which did not contain 50 per cent or more of spruce. It is too bad that, excepting those woodlot owners who have used good common sense in partial cutting, woodland owners have not realized what an asset they have had in red spruce growing stock.

A good example of the many woodlots which have been maintained for generations is that of Laurie Zinck at West Northfield, Lunenburg County. This property of 500 acres has been producing good quality timber profitably for seven generations and it still bears an excellent forest.

The worst enemies of red spruce are the spruce budworm, the eastern spruce beetle and, of course, man. Considerable red spruce has been clearcut in Nova Scotia since 1971 and the budworm and spruce beetle have destroyed millions of trees. The infestations of these insects continue.

Black spruce is one of the most abundant conifers of northern North America. It spans the continent from Newfoundland and the northeastern U.S. to Alaska from the northern limit of tree growth to Pennsylvania. Its range includes the northern part of the Lake States but excludes the southern part of the Prairie Provinces, Alberta and British Columbia.

In Nova Scotia, it grows in swamps where it is often the only merchantable species. It grows in bogs where it is generally only 1 or 2 inches in diameter and ten feet tall when 100 or more years old. It can attain an age of 250 years and, on the best sites, it can grow to about 90 feet in height and 18 inches dbh. The average size is about 60 feet and 8 inches at maturity in suitable habitats.

Black spruce has long been considered a slow-growing tree but red and black spruce hybrids have been found to exceed red spruce in height and diameter growth on the same site. Black spruce has few serious enemies, the worst of which is the eastern dwarf mistletoe in Nova Scotia. This causes a malformation of twigs known as witches' broom, which stunts growth and occasionally causes death. It is the least wind-firm tree of any species in Nova Scotia.

This species occurs in pure stands, in association with red spruce and, in western Nova Scotia, as an understorey with white pine. It is also found with larch, with red pine, with jack pine and with red maple and it occurs in mixtures in smaller percentages with other species.

The Canadian Forestry Service recommends clearcutting black spruce in relatively narrow strips and in small patches to obtain satisfactory regeneration.

This agency also states that logging with heavy machinery during most of the year is more damaging to black spruce advance growth and to the site than horse logging in winter.

BALSAM FIR

Balsam fir is a small to medium-size tree of the boreal forest and northern forest regions of North America. It grows from Newfoundland, Labrador and Nova Scotia northwesterly to Great Slave Lake and the Athabasca River in Alberta, but it does not reach the northern tree line. The range extends southward into the New England States, New York State and the Lake States. Southwestern Nova Scotia is in the southern limit of the range climatically and the quality here is now generally poor for anything except Christmas trees.

Balsam fir is found in practically pure stands in Nova Scotia, particularly on the Cape Breton Highlands and more generally in eastern Nova Scotia than in the western parts. It also occurs in various associations with other trees and shrubs. It is a pioneer species but will tolerate almost as much shade as red spruce here and respond quickly to release. Bracken, raspberry and hardwood sprouts are the chief competitors on clearcut lands.

In 1965-71 this fir amounted to 28.1 million cords or 25.1 per cent of the total forest volume of Nova Scotia, down from 26 per cent in 1958; 12,125,000 cords of this were in Cape Breton. The spruce budworm has caused the loss of over nine million cords of softwood in Cape Breton since 1971 and probably more than a million more elsewhere in the province. More than two-thirds of this loss is fir.

Second to the spruce budworm, the balsam woolly aphid is this tree's worst enemy in Nova Scotia, killing the trees or reducing tree heights by deforming and killing tops. Fir is also susceptible to attack from the blackheaded budworm, the hemlock looper, the gypsy moth and other defoliating insects. Fungus diseases are common in fir, particularly red heart rot, caused by *Trametes pini*. All in all, balsam fir is more susceptible to insect damage and disease than any other conifer in the province.

The best tree of this species seen by the writer was near Five Mile Lake in Hants County in 1931, before the woolly aphid had reached that region This tree was 18 inches dbh and more than 80 feet tall. The greatest dbh found for balsam fir in Bowater Mersey's continuous forest inventory, 1979-81, was 17.1 inches, in Digby County. On the higher elevation of the Cape Breton Highlands, the fir trees are quite short by nature—not because of the woolly aphid which cannot survive the winter temperatures there. Although some fir may reach an age of 200 years, trees over 70 are overmature. A healthy mature fir forest is generally from 60 to 70 years old, containing trees 4 to 15 inches dbh, and averaging about 20 cords per acre.

Stands comprising 50 per cent or more of fir should be clearcut before reaching overmaturity. In shelterwood and selection forests fir should be eliminated as soon as practicable. Culture of fir for Christmas trees has been discussed previously herein. Following clearcutting or mortality of spruce-fir stands caused by insect infestations, the new forest usually contains a higher percentage of fir. In plantations on lands so affected, fir will be a strong competitor against the planted trees and uncontrollable with herbicides if planted trees are to survive. It will be difficult to prevent fir from monopolizing the site in many cases and the competition between man's silviculture and that of the spruce budworm will be interesting to see.

The greatest value in balsam fir is for Christmas trees. It is second to the spruces in value as fibre and commonly fetches the same price as spruce in pulpwood markets. In some cases, pulpwood purchasers have specified a minimum of 60 per cent spruce. Fir is also sawn for lumber and good quality fir lumber is generally accepted as spruce. It is also used in the manufacture of hardboard.

HEMLOCK

Eastern hemlock follows much the same range as that of red spruce except that it includes the lower Ottawa Valley, all of southern Ontario, the northern part of the Lake States and extends broadly in the Appalachians south to Alabama and Georgia.

Commonly found in the early 1900s in almost pure stands more than 300 years old in the South Central, Valley and South Shore subdivisions of Nova Scotia, hemlock still comprises nearly 3,500,000 cords in the province. This is found in comparatively small residual stands. These nearly pure stands now cover only 1.1 per cent of the total forest area of Nova Scotia and hemlock is only found in association with other species on an additional 1.8 per cent of the forest area. It is most common in the South Shore, Valley and South Central subdivisions, and uncommon east of the St. Mary's River Valley. There was a strip of hemlock of about 400 acres on the Cape Breton Highlands in 1958.

In Pennsylvania hemlock has reached the age of 988 years, a dbh of 84 inches and a total height of 160 feet. The greatest diameter reported in Nova Scotia was 49 inches but the height of that tree is unknown. It was at Shelburne River in Queens County. Many old-growth hemlock stands in western Nova Scotia are comprised of trees 12 to 40 inches dbh with heights of 70 to 90 feet and ages of 350 to 400 years. The author counted 467 rings on a hemlock near Timber Lake, Lunenburg County in 1960.

For some unknown reason, hemlock does not now regenerate following fire as it did hundreds of years ago in Nova Scotia and its population here is rapidly declining. This probably good as it is largely being replaced by the more valuable red spruce.

Old growth hemlock should be clearcut but where there is 40 per cent or more of red spruce of ages less than 120 years partial cutting should be the rule, favouring the spruce to be left standing.

LARCH

Larch or tamarack has been discussed previously herein. Here it is also called hackmatack or juniper. One of America's hardiest trees, it grows along the northern limit of tree growth from Labrador to the Yukon Territory and its range extends southward to the prairies, the Lake States, New York State, the New England States and reaches into Pennsylvania and New Jersey. There is also a large separate area of larch in Alaska.

In Nova Scotia there were over 1,400,000 cords of larch in 1965-71 comprising 1.3 per cent of the total forest volume—up from 1,085,000 cords in 1958 according to the inventories. Pure larch stands covered 1.3 per cent of the forest area in 1965-71 and larch was found in association with other species on an additional 2.2 per cent of that area. It tolerates wet acid soils and is commonly found on bog or muskeg margins and in swamps, although it also does well on some better well-drained soils. It is the only coniferous tree of eastern Canada that is deciduous. The most common associate of larch is black spruce, followed by red spruce, balsam fir and red maple. A very intolerant pioneer species, it rarely exceeds 16 inches dbh in Nova Scotia. But R. Day reported one 22.6 inches dbh and 60 feet tall at Lake Annis, Yarmouth County. Because of its intolerance to shade, larch should be clearcut.

The worst enemy of larch is the larch sawfly which periodically becomes epidemic, defoliating stands over extensive areas for several years. Growth is retarded and, after two years of defoliation, mortality is severe. The larch casebearer, native to Europe, is another larch defoliator in Nova Scotia. Serious defoliation reduces growth and causes mortality. These two insects and the eastern larch beetle hold the larch population and larch tree maturity down.

WHITE-CEDAR

The range of northern white-cedar extends from a few miles east of the Nova

Scotia-New Brunswick border westward to Lake Winnipeg and north to James Bay. It includes the northern part of the Lake States, New York State and the northern New England States. This cedar also occurs in patches south as far as Tennessee and North Carolina in the Appalachians.

Apparently common in most of Nova Scotia in the 1600s, it was rare here by 1800. Now it is found only scattered in the narrow strip near the New Brunswick border; at Cedar Lake (now Cedarwood Lake according to the cartographers), three miles east of Corberrie, Digby County, and at Cedar Lake, nearly eight miles south of Middleton, Annapolis County. There are also a few small stands of cedar on the north slope of South Mountain in Annapolis County.

The 1958 forest inventory shows volumes of this species totalling 1,775,000 cubic feet in seven counties and the 1965-71 inventory shows a volume of 53,000 cubic feet in Annapolis County. The writer knows of cedar only in the four locations stated above. Its incidence in Nova Scotia is too small to warrant further discussion.

MAPLES

The range of sugar maple, hard maple or rock maple extends from Nova Scotia and the Saguenay River in Quebec west to southeastern Manitoba and western Minnesota, south to central Iowa, eastern Kansas and Missouri, east to Tennessee and northern Georgia, then northeasterly to and including northern New Jersey. This maple is Nova Scotia's most tolerant hardwood and commonly comprises from 60 to 90 per cent of the basal area on most sites supporting tolerant hardwoods.

Sugar maple reproduces by seed, by sprouting from stumps and, to some extent, by root suckers. The most sprouting occurs from trees less than ten inches in diameter. Mature trees and stands reach 300 to 400 years old, 70- to 110-foot heights and 20 to 36 inches in diameter. The largest reported sugar maple was in West Virginia. It was 66 inches dbh and 110 feet tall, with a crown spread of 76 feet.

In 1977 K. N. H. Greenidge reported six sugar maples in the Grand Anse Valley of northern Cape Breton measuring from 14 to 34 inches dbh with heights from 79 to approximately 100 feet. One tree was about 230 years old.

As of 1965-71, there were over four million cords of sugar maple in Nova Scotia, comprising 3.8 per cent of the total forest volume. This was down from 5.1 per cent as given in the 1958 inventory. Where mature trees of this species occurred in association with beech and yellow birch prior to the extensive mortality of those species, the maple suffered considerable deterioration following this mortality. Although not highly susceptible to insect damage, sugar maple is subject to root rot, butt rot and heart rot caused by several species of fungi. As with other tolerant species, its management is best under a partial cutting system, preferably group selection.

The principal uses of sugar maple now are furniture, fuelwood, hardboard and maple syrup. It usually takes at least 32 gallons of sap to make a gallon of syrup or 8 pounds of sugar.

Red maple is found in practically all of eastern North America south of the 48th parallel of latitude and east of the Mississippi River, except in Newfoundland where it occurs only on the Avalon Peninsula and in a small area near Corner Brook. It is a most vigorous sprouter and grows under a wide variety of conditions. It is found in association with nearly all species in Nova Scotia and it is common in swamps, often comprising pure stands. A pioneer species, generally overtopping the slower growing softwoods following clearcutting, it also shows some shade tolerance. This tree rarely lives for more than 150 years but it has been known to reach a diameter of 5 feet and a height of 129 feet. The average mature tree attains a dbh of 18 to 30 inches and height of 60 to 90 feet.

Here it is commonly used as fuelwood. It is also used for mine packs and in the manufacture of hardboard. With a total volume of about 14 million cords, it is Nova Scotia's most common hardwood and increasing as clearcutting increases. According to the inventories, it increased from 10.4 per cent of the total forest volume in 1958 to 13 per cent in 1965-71.

BIRCHES

The northern limit of the range of yellow birch is about the same as that of red maple but in the U.S. it includes only the Lake States and the Northeast States south to Pennsylvania and New Jersey, extending southward to Tennessee and Georgia in the Appalachians. It is a tolerant succession species which, like beech and sugar maple, occurs mostly on well-drained soil, but is not as tolerant as those two species. In Nova Scotia it is found in association with them and with white birch ironwood, black cherry, hemlock, white pine, balsam fir and red spruce. And in some young stands there is considerable mountain maple, a small non-commercial tree.

Mature yellow birch on average sites may be 30 inches dbh and 90 to 100 feet tall at 200 years of age. A yellow birch on MacNutt Island in Shelburne Harbour was reported by R. Burrill to be 55.1 inches in diameter; no height was given for this tree. Another, measured by Robert Mouzar near

Toney Lake, Queens County, was 16 inches dbh and 88 feet tall. Another yellow birch tree in Hants County was 37.3 inches dbh.

There has been no recurrence of birch die-back in Nova Scotia since the 1940s. The birch leaf skeletonizer is a serious enemy and has caused some yellow birch and white birch defoliation in Nova Scotia in recent years. Yellow birch is often infected with heart rots, most commonly caused by the fungus *Fomes igniarius*. Young trees of this species are often girdled by mice, rabbits and porcupines. Yellow birch is a favourite browse of deer, and partridge feed on its buds, catkins and seed.

Yellow birch is Nova Scotia's second most common hardwood, totalling over 6,600,000 cords in 1965-71 or 5.6 per cent of the total forest volume, down from 7.6 per cent as of 1958. When of good quality it is also one of the most valuable native woods. In 1970 in Maine and New Hampshire yellow birch suitable for veneer stock was valued at $200 per thousand board feet standing. Formerly much used in shipbuilding and for furniture, flooring and clothes pins, it is now used mainly for furniture, hardboard and fuelwood in Nova Scotia. The quality of yellow birch deteriorated greatly at the time of the die-back but there are now some good quality young stands here and there.

White birch or paper birch is common in most of Canada, a transcontinental species that extends almost to the northern limit of tree growth. Its range includes the Lake States, the New England States, the Adirondack Mountains and the highlands of Pennsylvania.

This is a pioneer short-lived species, requiring full overhead light throughout its life. Trees in mature stands average about 10 inches dbh and 70 feet in height at from 60 to 75 years of age. On the best sites an occasional white birch may reach 30 inches dbh and 100 feet in height.

The birch die-back in the forties reduced the white birch population in Nova Scotia severely but there were over three million cords as of 1965-71, comprising 2.9 per cent of the total forest volume. This was up from 2.6 per cent as shown in the 1958 inventory.

White birch in the past was used mainly for spools, clothes pins and fuel. The major use now is fuel and this birch is used in the manufacture of hardboard. It was the bark of white birch from which Indians made canoes.

Gray birch, also commonly called wire birch, is another short-lived pioneer species which seeds burned and cut-over areas and abandoned fields. It is quite intolerant and often choked out by more tolerant trees when it is only of pole size. Gray birch trees occasionally do reach 12 inches dbh and 60 feet in height. This species is common throughout Nova Scotia but more prevalent in the western part. Its range extends from this province to Ontario and south to Pennsylvania, Michigan and Iowa. Trees of this species are highly susceptible to wind and particularly sleet damage. The birch casebearer and the birch leaf skeletonizer attack this species, particularly the former in Nova Scotia. Its feeding turns the foliage brown year after year at times. Twigs and branches die from this defoliation, but the trees usually survive for several years or more. Gray birch is now used mainly for fuelwood and the manufacture of hardboard in Nova Scotia. As of 1965-71, there were about 260,000 cords here, comprising 0.2 per cent of the total merchantable volume.

RED OAK

Red oak, previously discussed, is declining in Nova Scotia through attacks o various species of insects since the early 1930s. Its main uses now are for fuel hardboard manufacture, lath for lobster traps; there is still some oak lumbe sawn. In 1982 the price for good quality oak 6 to 8 inches diameter wa $80 per cord, and 8 inches and over, $105 per cord or $210 per thousan board feet, delivered at Brooklyn, Queens County.

Under forest conditions red oak develops a tall, straight columnar bole but open-growth trees tend to be short with large spreading crowns. Such a tre was reported near Bear River, Digby County, having a diameter of 59.5 inche (no height given). An oak near Trout Pond, Queens County was 14.1 inche dbh and 50 feet tall; another was 20.9 inches.

This northern red oak is common east of the Mississippi River except i Florida, southern Alabama and Georgia and the eastern Carolinas. Beside Nova Scotia, it occurs in New Brunswick, southern Quebec and Ontario. We of the Mississippi, it is found through Minnesota and parts of Iowa, Nebrask Kansas and Oklahoma.

The 1965-71 forest inventory showed over one million cords of oak i Nova Scotia, comprising 0.9 per cent of the forest. This tree is intermediate i tolerance, growing in pure stands and in association with most other species. is most common in western Nova Scotia, and although rare on the easte mainland and in most of Cape Breton, it is an important component of th forest at Pleasant Bay and near Cape North.

ASPEN

The aspens or poplar, also called popple in Nova Scotia, comprise t trembling or quaking aspen, the largetooth or bigtooth aspen and balsa poplar or balm-of-Gilead. The largetooth and quaking aspen are comm pioneer species here, generally seeding after land has been burnt. The light shade of the foliage of these two species provides excellent protection for white pine against the white pine weevil.

The poplars are regarded as soil improvers, drawing nitrogen from deep in the mineral soil and distributing it on the surface where fire has left little or no nitrogen. These three species commonly produce root suckers which often grow to mature trees.

The three poplars occur in practically pure stands and in association with other pioneer hardwood species and balsam fir. They are generally of poorer quality in Nova Scotia than in most parts of their respective ranges, and are less long-lived here. The largest poplar reported in Nova Scotia was 19.6 inches dbh and 80 feet tall, at Doucetteville, Digby County. Another poplar in Digby County was 20.9 inches dbh. Here they rarely live more than 80 years and most trees over 14 inches diameter have considerable rot. But growth is rapid.

These poplars have many enemies, including a number of species of defoliating insects and butt-rotting fungi. Hypoxylon canker kills many trees by girdling, and last but not least, poplar bark is the beaver's favourite food.

The range of trembling aspen is transcontinental in Canada, extending from the northern tree limit south to central New Jersey in the east and Iowa; the southern limit of the range proceeds northwestward to British Columbia, except that it grows in the mountains of the western U.S. as far south as Mexico.

The range of the largetooth aspen extends from Cape Breton west to Manitoba and from Maryland west to Iowa. The northern limit of the range is just south of the 50th parallel of latitude. It extends south to Tennessee and western North Carolina.

The balsam poplar has much the same range as the trembling aspen but it does not extend as far southward. In this province the balsam poplar is found only along streams and open intervals in northern Cape Breton in natural conditions. In the 1800s and early 1900s, the sticky fragrant leaf buds were thought to have medicinal qualities and this "balm-of-Gilead" was planted around many country homes throughout Nova Scotia as a shade tree. The tree readily reproduces from root suckers and in some places the only evidence now of a former farm home is an old cellar and a clump of these trees. This, like the other poplars, is a short-lived pioneer species, requiring full sunlight.

In Nova Scotia, these poplars are used mainly for plywood, pulpwood and hardboard. Some is used as fuelwood but it burns quickly without giving much heat. The aspens or poplars made up over two million cords or 2 per cent of the forests of Nova Scotia as of 1965-71.

ASH

There are three species of ash growing in Nova Scotia, having a total of about 325,000 cords and comprising approximately 0.3 per cent of the total forest merchantable volume. The white ash is the most common. It occurs throughout the province and in pure stands in the Annapolis Valley and Western subdivisions. Otherwise it is found scattered in association with other species, more so with hardwoods and balsam fir. Its range extends from Cape Breton to Minnesota and south to Florida and Texas.

This species is almost entirely limited to good quality, well-drained soils. When young it is a shade-tolerant tree, but old white ash trees cannot tolerate much shade. The largest trees of this species on record were two at Glenn Mills, Pennsylvania which measured 7.1 and 6.7 feet dbh and 80 and 98 feet tall. The largest in Nova Scotia was 40.7 inches dbh but only 35 feet tall at Cole Harbour, reported by Ira Settle. This was probably a shade tree growing in the open, for white ash trees in forests grow to 80 feet tall here and a number 36 inches or more at dbh have been seen.

As of 1965-71 there were nearly 350,000 cords of white ash in Nova Scotia, comprising 0.3 per cent of the total standing merchantable volume. One of the most valuable species in the province, it is used for tool handles, lumber and hardboard. It responds well to thinning and is a valuable component of selection forests. Shelterwood and selection systems are recommended for this species.

All three species of ash here are attacked by defoliating insects, none of which does serious damage. The most troublesome disease here is a rust of foliage and twigs of ash trees occurring within 400 yards of marshes containing grass which is an alternate host. This rust, *Puccinia peridermiospora,* will kill mature trees within several years if humidity is high.

Black ash, with a little green ash, made up little more than 40,000 cords of Nova Scotia's forest in 1965-71. Both black ash and green ash are found in swamps and along margins of bogs, scattered sparingly throughout the province. Although found on poorly drained soils in natural forests these, as well as white ash, do well when planted on good, well-drained soils.

The intolerant to moderately tolerant black and green ashes are most common in the Annapolis Valley and South Central subdivisions of the province. The range of black ash extends from southwestern Newfoundland to southeastern Manitoba and eastern North Dakota, then south to Iowa, Illinois, West Virginia and Delaware. The green ash range extends from Cape Breton to southeastern Alberta, eastern Montana and southward to central Texas and northern Florida. The green ash is the least common of the ashes in any part of its range. Both of these species occur in association with red maple.

The largest black ash on record is 2.8 feet dbh and 79 feet tall, a tree in Chippewa County, Wisconsin. The largest green ash record is that of a tree in Missouri, 4.4 feet dbh and 106 feet tall. No size records are available for these species in Nova Scotia but the writer has not seen one of either species more than 20 inches dbh and 70 feet tall.

The ashes are used for tool handles, oars, canoe paddles, baseball bats, furniture and veneer. Ash splits evenly in thin bands and, as mentioned previously, is most commonly used in basket weaving.

BLACK CHERRY

Black cherry, the largest native cherry of North America and the only one of commercial value, grows from central Nova Scotia west to Minnesota, south to central Florida and central Texas. A variety extends from Arizona the full length of Mexico into the central American counties. In Nova Scotia, it is more common in the North Central and South Shore subdivisions and in the South Central and Valley subdivisions. It occurs sparingly in pure stands and in association with red maple and with gray birch in Nova Scotia.

An intolerant tree, black cherry grows rapidly for 40 to 50 years and then slows down. According to Saunders, it normally reaches one to two feet in diameter and 50 to 60 feet in height, usually living to an age of from 150 to 200 years in Nova Scotia. A maximum height of 129 feet and age of 258 years has been recorded in the Allegheny National Forest. The wood has high value for furniture and cabinets but as of 1965-71 there were only about 1,800 cords in Nova Scotia. Ripening in September here, the cherries make delicious jam and jelly.

Hares and deer destroy many cherry seedlings and sprouts. Black cherry was probably more common in this province before the deer population became so heavy starting in the 1920s.

ELM

The American elm or white elm is found throughout eastern North America, from Cape Breton westward through southern Quebec and Ontario to Lake Winnipeg and eastern Saskatchewan, then south to central Texas and east along the Gulf of Mexico to include northern Florida.

With less than 20,000 cords shown for all Nova Scotia in the 1965-71 inventory, it is not an important commercial species here. Widely planted, however, it has been Nova Scotia's most important shade tree. Shaped like a feather duster standing on the end of its handle, an elm tree alone in the open can be easily identified from a long distance.

Scattered mostly on the intervals throughout the province, these elms are best developed along the river valleys of the central and northern counties. They mature at about 150 years but some reach ages of 300 years. Trees growing in the open have reached 11 feet in diameter and 100 feet or more in height in the U.S. The largest elm reported in Nova Scotia was 71.6 inches in diameter and 74 feet tall at St. Croix, Hants County as reported by F. Scott.

Elm was attacked by many defoliators and the Dutch elm disease is spreading throughout. As discussed previously, it appears that all American and European species of elms in eastern North America are doomed to extinction.

The provincial forest inventory of 1965-71 shows 1.8 per cent or more than two million cords of the gross merchantable volume of the forests of Nova Scotia to be beech.

BEECH

The greater volumes of beech in Nova Scotia now occur in Cape Breton and in the North Central subdivision but beech is found in nearly all parts of the province. It is a tolerant hardwood but the beech bark disease makes most of it unmerchantable now.

IRONWOOD

Ironwood, also known as hornbeam or hophornbeam, is a small deciduous tree rarely exceeding 10 inches dbh or 40 feet in height. As the name implies, the wood is hard and heavy, about 50 pounds per cubic foot. It occurs only on good, well-drained soil, usually scattered among other tolerant hardwoods. Its range is from Nova Scotia to Minnesota and south to Florida and Texas. In Nova Scotia it is found widely scattered on ridges and slopes, mainly from Annapolis County to Antigonish County. It has also been found rarely in Shelburne, Queens, Guysborough and Inverness counties.

A NOTE ON HARDWOOD SILVICULTURE

Most of the low grade hardwoods excepting poplars can be sold as fuel and it has been reported that prices of $75 to $100 per cord have been paid in Halifax for dry fuelwood, split and cut to stovewood or fireplace lengths. The burning of particulated wood is now being studied, and it appears that this will soon be the most efficient and most popular way of burning wood.

According to J. H. Johnston of the Maritimes Research Centre in 1979, only 43 per cent of the allowable cut of hardwood in Nova Scotia was being utilized. There are over 34 million cords of this material in the forests of the province and its utilization is increasing with the developing shortage of softwood. Increased hardwood utilization, properly managed, should improve silviculture of nearly all species, including softwoods, but pity the forest managers who succeed those who entirely denude their land of hardwoods in order to produce conifers in monocultures.

In stands of tolerant hardwoods (beech, yellow birch and sugar maple) where there are enough trees of good quality to warrant silviculture, the better systems are shelterwood, intermediate cuttings, single-tree selection or group selection. Intermediate cuttings are those in which the first thinnings are made when stands are 45 to 50 years of age and the trees removed are of merchantable size. Following this, any of the other systems previously described provide good results.

These silvicultural systems are applicable also to stands of these species in association with red spruce, hemlock, white pine and balsam fir, provided the fir comprises less than 50 per cent of the stand volume. As in any partial cutting, the most vigorous trees should be left to be cut only as "crop trees," and balsam fir should be eliminated as soon as practicable.

A NOTE ON HERBICIDES

Following are exerpts from a paper "Use of herbicides deemed essential" presented by Malcolm Barkhouse, Silviculture Forester, Bowater Mersey Paper Company Limited, at the annual meeting of the Nova Scotia Forest Products Association, January 1982:

> Herbicides are being used as a means of controlling unwanted vegetation, particularly in plantations or naturally regenerated sites, and also to some degree as a means of site preparation prior to planting.
>
> Manual cleaning of this type of developing stand has been done and, in fact, will continue to be carried out. However, there is simply not enough manpower, or money, available to handle the area requiring treatment, hence the move to herbicides.
>
> For the larger acreages, most companies will utilize helicopters which are efficient, fast and the least expensive. Costs, including chemical, during 1981 were approximately $30.00 per acre. On the other hand, ground

> spray work is likely to be in the $65-$80 per acre range, depending on operating conditions.

The writer has been told that herbicide spraying does not kill all the red maple and this is good. This species does not compete with softwoods except for space and sunlight, and it does provide fertilizer more efficiently than it can be provided any other way. Weeding is rarely necessary under partial cutting as weeds are mostly pioneer species that do not do well in partial shade.

The weeds which obstruct coniferous regeneration following fire or clearcutting consist of raspberry, other brush, poplar, birch, pin cherry and/or red maple and mountain maple. Excepting yellow birch and the maples they cannot tolerate the shade provided by residual trees following proper partial cutting, but they often crowd the conifers out or delay their growth by decades under full sunlight.

In 1981 some herbicide spraying with 2,4-D and 2,4,5-T from helicopters was undertaken by the pulp and paper companies. Nova Scotia Forest Industries Limited, Scott Paper and Bowater Mersey planned to spray some 35,000 acres in 1982 but so-called environmentalists opposed this. They convinced the gullible portion of the public that there would be dire effects on people living 20 miles or more from the sprayed areas.

Permits which had been granted by the province for this aerial spraying were cancelled, but permission for spraying from the ground was granted to Bowater Mersey. This company had planned to spray 3,200 acres but, because of the increased cost of ground spraying, this was reduced to 1,000 acres. The cost of helicopter spraying is now said to be $35 per acre, ground spraying $65 to $70 and manual cleaning (of weeds) and spacing $200 per acre.

So, the total cost of weeding natural regeneration, which may follow clearcutting, by herbicides ranges from $35 to $70 per acre and considerably more if done manually. But the herbicide treatment still leaves balsam fir which must now be considered undesirable or at least far inferior to spruce. It is increasing on clearcut lands in many cases.

CLIMATE

Its moist climate gives Nova Scotia a great advantage over the inland provinces in the comparatively easy establishment of forest regeneration, particularly of valuable red spruce.

On the other hand, the wet maritime climate assures the regeneration of balsam fir which, because of its vulnerability to attack by disease and destructive insects, must be considered undesirable except for the Christmas tree industry. In this industry, most trees are cut before they reach the age of 25 years.

Normal winds are important in distributing pollen and seed of most tree species but they also spread many harmful tree diseases and insects such as the spruce budworm, the balsam woolly aphid, the beech bark louse (and its accompanying *Nectria* fungus disease) and the Dutch elm disease.

Nova Scotia's maritime location gives the province a complex climate. Conditions are maritime along the coast, transitional extending about 20 miles inland, and then continental farther inland.

The Atlantic Ocean tends to moderate the climate so that the low and high temperatures in the province do not reach the extremes that they do at those latitudes in the interior of Maine, New Brunswick and farther inland.

The growing season or frost-free season is usually weeks longer in the coastal zone, particularly along the south shore, than it is inland. Plant growth, however, is generally slower because of less sunshine and lower summer temperatures. The highest recorded temperature at Cape Sable before 1975 was 75 degrees Fahrenheit, but in southern Antigonish County it reached 101 degrees Fahrenheit. The highest minimum temperature in the province was –1 degrees Fahrenheit at Cape Sable and the coldest was –42 degrees Fahrenheit near Stewiacke, Colchester County.[96] The highs and the lows elsewhere in Nova Scotia vary between these extremes; coastal temperatures are generally lower in summer and higher in winter than those inland, even only a few miles inland from the Atlantic coast.

The greatest amounts of rainfall from April to October occur along the Atlantic shore and over the higher elevations inland. Totals in these areas for this five-month season average 20 inches or more. Elsewhere in Nova Scotia the range is from 15 to 19 inches. Precipitation is generally evenly distributed throughout the season, but July tends to be the driest month.[96]

The median duration of snow cover varies from about 100 days near the southwestern tip of Nova Scotia to more than 140 days on the northern part of the mainland and the western part of Cape Breton Island. Since 1930, drifts along the edges of bogs on the Cape Breton Highlands have sometimes continued into early July.

> The lowest average amounts of snowfall, 50 to 80 inches per year, are found near the mouth of the Bay of Fundy, along the Atlantic Coast . . ., near the shores of Minas Basin and near the eastern end of Northumberland Strait. Average amounts of 80 to 120 inches fall in most other sections but averages in excess of 140 inches per year are found on the Cape Breton Highlands. . . .
> There is considerable variation at any one place from year to year. At Halifax, for example, with an average annual snowfall of 83 inches, five successive seasons between 1966 and 1971 produced total snowfalls of 112, 78, 36, 75, and 119 inches.[96]

The maximum snow depth recorded on the mainland is more than five feet in southern Annapolis and Kings counties and more than 7.5 feet on the Cape Breton Highlands. The minimum snow depth recorded is less than 20 inches along the coast of Queens and Shelburne counties. Fog may occur in any season of the year but it usually comes in summer and fall; July is the mistiest month. "The cool waters of the Bay of Fundy and the Atlantic Ocean are efficient producers of fog and mist when in contact with warm moist air which has come from southern latitudes."[96] Most of Nova Scotia and the Fundy Shore of New Brunswick get more fog than any other part of eastern Canada. It occurs here 15 to 25 per cent of the year. In general, the closer to the shore, the higher the frequency of fog. Fog banks are often seen lying a few miles off shore, affecting only the headlands by day and moving inland in the late afternoon or evening. They usually retreat seaward again the next morning. The fog often appears to roll inland, even against strong breezes at times, and tongues of it stretch into bays and valleys before they touch the higher lands. Often the uplands remain free while lower elevations have dense fog cover.

Winter storms occur occasionally when ground temperatures are below the freezing point but warmer air produces rain or drizzle. As the liquid precipitation reaches the freezing level, most of it freezes on contact with cold objects such as trees, power lines and pavement. Between 1957 and 1966, the mean number of hours with freezing precipitation per year recorded in Nova Scotia varied from 19.2 at Yarmouth to 53.9 at Sydney.[96] Such storms, often called sleet storms, have done considerable damage to forests in this province. Much of the damage has been to gray birch, a fragile tree of little value. There has also been considerable damage to spruce; tops have broken off trees of all ages, down three to eight feet from the tip. Sometimes the whole crown has broken off. The broken tops permit water to get into the remaining part of the tree trunks and rot proceeds downward. A particularly bad storm of this type occurred in Yarmouth and Digby counties in the early 1920s. Many of the old growth spruce lost their tops and now have rot extending downward a few feet.

Nova Scotia's climate has undergone many changes, all affecting vegetation. Climatologists claim the mean annual air temperature at mid-latitude in the Northern Hemisphere was less than 60 degrees Fahrenheit until after 6000 B.C. However, the Gulf Stream tends to moderate the climate of Nova Scotia. The warmest weather in the present interglacial period followed the receding glacier and reached its warmest circa 5000 B.C. After that, there were three climatic fluctuations in the Northern Hemisphere, hundreds of years apart, from warm and dry to cold and wet. The last of these was between 1300 and 1870 A.D. and was called the "Little Ice Age." It was the coldest period in the Northern Hemisphere since the glaciers disappeared from America. The Little Ice Age must have affected all life in Nova Scotia, but apparently not as much so as in Newfoundland, Greenland, Iceland and western Europe.

In the latter half of the nineteenth century the climate began moderating, and this general warming trend continued until 1940 in the central United States and until 1955 in Nova Scotia. Since then there has been a cooling trend of more than 0.9 degrees Fahrenheit yearly, due primarily to cooling at high and mid-latitudes.[96]

Some regions, including the Canadian Arctic, the far west of the United States and parts of Europe and Asia actually grew warmer; however, that part of North America between longitude 110 degrees and the east coast and between latitudes 30 degrees and 50 degrees, along with parts of Europe and Asia, grew sharply colder from 1940 through 1978. Lafayette, Indiana recorded a drop of 4.0 degrees Fahrenheit in its mean annual temperature in this period.[122]

This cooling trend did not affect Nova Scotia until 1955 when average winter temperatures (December, January, and February) reached their peak; 28 degrees Fahrenheit at Shearwater and 26 degrees Fahrenheit at Greenwood. From then until 1967 these averages dropped to 26 degrees Fahrenheit and 23 degrees Fahrenheit respectively. By 1974 these respective temperatures were 25 degrees Fahrenheit at Shearwater and 23 degrees Fahrenheit at Greenwood (see chart).

The following comments from the U.S. National Science Board regarding climate are interesting to note. In 1972, the board stated, "Judging from the record of past interglacial ages, the present time of high temperatures should be drawing to an end, leading into the next ice age." In 1974, they said, "During the last 20 to 30 years the world temperature has fallen, irregularly at first but more sharply since 1964." In 1975, they commented again, "The climates of the earth have always been changing and they doubtless will in the future. How great these changes will be, where and how rapidly they will occur we do not know. We live in an unusual epoch: today polar regions have large ice caps whereas during most of the earth's history the poles have been ice-free."[123]

This cooling trend and the comments made about it should not cause undue alarm, however. At the present rate, it will be some years before its effect becomes serious here, and it is quite possible that the trend will reverse. Although the Little Ice Age was the most important factor in ending the Viking settlements in Greenland, the climate later warmed.

Some climatologists indicate that the accelerated release of carbon dioxide from factories, home heating units, automobiles and forest fires may soon reverse the trend to one of increasing temperature. However, despite these influences the trend continues to be a cooling one. Should this continue another decade or so foresters and agriculturists might be well advised to consider the biological effects of shorter growing seasons and lower temperatures. Black spruce, balsam fir and jack pine thrive in such conditions while red spruce, white pine and red pine are little affected. Red oak, which has been suffering from various insects and diseases for the past 50 years, would likely decrease. Shrubs in western Nova Scotia such as poison ivy, green briar and inkberry would also probably decrease.

EPILOGUE

After a long and varied forest history, Nova Scotia is on the threshold of modern forest management. Interest in forestry is certainly much stronger today than when the writer was a practicing professional. Several things have combined to bring this about, but the real catalyst has been the spruce budworm.

As one who has spent a lifetime working in, and concerned about, the forest as it relates to human beings, I welcome this increased commitment.

But I am not optimistic about the future. We have some unique forestry problems in this province. Foremost among these is not the budworm, nor indeed any other similar threat, but the need to bring thousands of idle woodlots under management. Small woodlots comprise fully half our forest land—the best and most accessible half, too. And the active ones produce approximately half the wood consumed each year. It is true that many owners have done very well by their woodlots—indeed have been practicing good forestry for generations, especially in Lunenburg County, and their land bears witness to this. Lately too, with government help, a few thousand more have taken the path to forest rehabilitation and renewal. But most are either unconcerned, or think that forests are best left to Nature, that a tree standing is "money in the bank." The results of such a policy are slow growth, increased losses to pests, fire and storms, and poor regeneration—in a word, stagnation. Trees mature and die—they will not keep. Trees destined for human use need tending and investment. In Nova Scotia we have a forest suffering from two centuries of, on the one hand, exploitation and on the other, neglect.

I have another reason for pessimism. It is the prevalence of the practice of clearcutting—taking all the trees off an area regardless of age or size of trees. As a professional forester I recognize that in certain conditions clearcutting is the only viable option. Mature balsam fir and white spruce, for example, will suffer blowdown if partially cut. There are also salvage situations, such as overmature stands, which demand clearcutting.

I am also well aware of the economic advantages of concentrating all road building, felling and extraction in one streamlined operation, and of the difficulty of assembling the skilled labor, specialized machinery and sustained investment which other methods call for.

Still, I remain unconvinced that clearcutting is the best option for the majority of our forest types, especially in western Nova Scotia. After studying the lessons of history and the experience of the United States, Scandinavia and Germany, I am reasonably certain that clearcutting as commonly practised here offers little or no economic advantage over partial cutting systems when all costs are added in; and, furthermore, that over the long run it is ecologically unsound. Yet clearcutting with planting is the chief method practiced in Nova Scotia today. Down the road I think we will pay for this in decreasing water quality.

Perhaps planting combined with silviculture will do more than I expect. But I think they're making a mistake planting the Cape Breton Highlands, for instance. They're going to have a hard time keeping the fir out of those plantations; I think they'll have to clean and thin the fir to save the spruce. Better to let the fir grow, clean and thin it, then harvest at 35 years or so before the budworm gets into it.

On a more optimistic note, we are seeing a lot more silviculture today. Landowners of all types, from large pulp and paper companies to small woodlot owners, are doing it. This is all to the good. Moreover, partial cutting is being prescribed more often. And we have many more groups hiring foresters and forest technicians than was the case in my day.

Unfortunately, the price of wood today doesn't encourage a landowner to do any silviculture at all. Government incentives are all right, but they are not the whole answer. Healthy, well-managed forests functioning in a healthy market economy should not need subsidization. If handled properly they will pay their own way.

To sum up, I believe that although things are improving in some areas, sooner or later we must accept a higher cost of logging to ensure that it is done properly. I would like to see partial cutting practiced wherever possible, leaving a good residual stand regeneration of desirable species. If you add the cost of planting and herbicides that clearcutting requires, selection cutting methods are competitive. But we need more research on selection cutting as a viable alternative—research on both machines and techniques. A good compromise solution is shelterwood cutting—much better than clearcutting because the new stand is established before the old is removed.

Due to glaciation and past fires, Nova Scotia will always have a lot of land, especially in western counties, that does not produce much timber. In the past the losses province-wide from forest fires were horrific. Since 1926 the Department of Lands and Forests has done a good job of preventing, detecting and controlling forest fires—in this they are a leader in Canada. That high standard must be maintained. Now, if foresters and scientists can discover equally acceptable means for preventing, detecting and controlling forest pests and diseases—which together destroy more wood than does fire—and if they can put in place forest management systems that are ecologically sound and economically viable, then forestry in Nova Scotia will be the envy of all Canada.

GLOSSARY

burden	the carrying capacity of a ship or vessel. A ship of x tons is capable of carrying x tons at sea.
cadastral	showing or recording property boundaries.
cant	a log slabbed on one or more sides.
cull	to select from a group (v.); something rejected esp. for being inferior or worthless (n.).
d.b.h. or dbh	tree diameter breast high, exactly 4 1/2 feet above the ground.
deal	a square-sawn softwood timber 2 to 5 inches thick by 5 to 9 inches wide. A standard deal is 9 inches wide, 12 feet long and 3 inches thick.
eustatic	relating to or characterized by worldwide change of sea level.
f.b.m. or fbm	feet board measure.
flowage	a body of water formed by overflowing or damming.
f.o.b.	free on board.
futtocks	curved timbers scarfed together to form the lower part of the compound rib of a vessel.
garboard	the strake next to a ship's keel.
high grading	cropping or extracting from a forest only the larger and better trees of desired species with no regard to silviculture nor to the future of the residual forest or land.
insolation	exposure to the sun's rays; solar radiation that has been received.
jumper	any of several types of sleds hauled by animals.
keelson	a longitudinal structure extending along and above the keel of a vessel in order to strengthen its framework.

m.b.f.	thousand board feet.
navel	the central point or midship of a vessel.
pitprop	a mine prop or post; a small timber, usually round, used close to the working face in a mine gallery, generally as a temporary support (a column) between floor and roof.
plus-tree	select tree, superior tree; a phenotype judged to be unusually superior in some quality or qualities, e.g., exceptional growth rate relative to site, desirable growth habit, high wood quality, etc.
poll	the flat end of a striking tool as a hammer or an axe.
pulpwood	wood, usually round, used for making pulp for manufacture into paper or other products.
ribband	a long narrow strip bent and bolted longitudinally to the frames of a vessel to hold them in position during construction.
scantling	a loose term for any square-cut length of timber of cross section not fitting into standard categories.
selection cutting	the periodic removal of trees, particularly the mature and defective, individually and in small groups from a forest with silviculture the primary consideration.
selective cutting	creaming, high-grading; a type of exploitation cutting that removes only the most desirable trees regardless of silviculture or the future of the residual forest or land.
silviculture	a branch of forestry dealing with the theory and practise of controlling the establishment, composition, constitution and growth of forests.
taiga	subarctic coniferous forest that begins where tundra ends.
tote road	a wagon road or sled road for hauling supplies and equipment to a logging camp.
treenail	a peg made usually of dry wood so as to swell in its hole when moistened.
truck	a small wooden cap at the top of a mast.
windthrow	blowdown, windfall; a tree or trees uprooted by wind.

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Ralph Johnson cruising in Wreck Cove area in the early 1970's.

Ralph S. Johnson has been an active forester in eastern Canada for more than half a century. His work as a cruiser, forester, manager and researcher was instrumental in the establishment and operation of Bowater Mersey Paper Company's forestry department.

Born in Atlantic City, New Jersey in 1900, he earned a Bachelor of Science in Forestry degree at New York State College of Forestry. Timber cruising jobs in the early 1920s took him to Nova Scotia, North and South Carolina, the Ottawa Valley, Newfoundland, Quebec and northern New Brunswick.

Returning to Nova Scotia in 1928, he worked for Bowater Mersey Paper Company for 37 years, 31 as chief forester. He is particularly proud of the program of selection cutting he began in 1946.

Ralph Johnson is one of only two Nova Scotians to be named a Fellow of the Canadian Institute of Forestry. He has been a member of that organization and the Society of American Foresters for more than 50 years and has published articles in several forestry journals.

He is a past president of the Nova Scotia Forestry Association and was active in several industry/government committees, especially concerning forest tax matters.

He has lived in Liverpool, N.S. for more than 50 years.

Forests of Nova Scotia is the story of how the province's forests evolved and how man assumed the role of major caretaker. It's a story of a constantly changing relationship shaped by timber barons and politicians, native peoples and early settlers, campcooks, teamsters and loggers.

In this first definitive history of Nova Scotia's forests, Ralph Johnson takes the reader from the end of the last ice age to the complex world of 1982. Woven through this chronicle of developing forest industries, transportation, legislation and colorful characters is the author's obvious concern for the future of this vital resource and those who depend upon it.